Coginchaug River Watershed Summary

Laurel Brook, Wadsworth Falls Pond, Lyman Meadows Brook

WATERSHED DESCRIPTION AND MAPS

The Coginchaug River watershed covers an area of approximately 18,129 acres in central Connecticut (Figure 1). There are multiple municipalities located at least partially in the watershed, including Guilford, Madison, Durham, Middlefield, and Middletown, CT.

The Coginchaug River watershed includes three segments, Laurel Brook (CT4607-13_01), Wadsworth Falls Pond (CT4607-00_UL_pond_01), and Lyman Meadows Brook (CT4607008_01), impaired for recreation due to elevated bacteria levels. These segments were assessed by Connecticut Department of Energy and Environmental Protection (CT DEEP) and included in the CT 2010 303(d) list of impaired waterbodies. Some segments in the watershed are currently unassessed as of the writing of this document. This does not suggest that there are no issues on these segments, but indicates a lack of current data to evaluate the segments as part of the assessment process. An excerpt of the Integrated Water Quality Report is included in Table 1 to show the status of some of the other waterbodies in the watershed (CTDEEP, 2010).

Laurel Brook (CT4607-13_01) begins at the outlet of an unnamed impoundment pond along the brook's course, upstream of Red Road in Middletown, flows north into Wadsworth Falls State Park in Middletown, and ends at the confluence with the Coginchaug River in the State Park. The impaired segment is 1.17 miles long and is located entirely within Middletown (Figure 2).

Wadsworth Falls Pond (CT4607-00-UL_pond_01).is a small pond located within Wadsworth Falls State Park on the Middletown–Middlefield town border. The entire pond is impaired, and is located east of the Coginchaug River, upstream of the confluence of the Coginchaug River and Laurel Brook, and downstream of the confluence of the Coginchaug River and Wadsworth Brook. Wadsworth Falls Pond is 1.37 acres and is located within Middletown and

Impaired Segment Facts

Impaired Segments:
1. Laurel Brook (CT4607-13_01)
2. Wadsworth Falls Pond (CT4607-00_UL_pond_01)
3. Lyman Meadows Brook (CT4607-08_01)

Towns:
Middletown and Middlefield

Impaired Segments and Lengths /Area:
CT4607-13_01 (1.17 miles)
CT4607-00_UL_pond_01 (1.37 acres)
CT4607-08_01 (1.43 miles)

Water Quality Classifications: Class A

Designated Use Impairments: Recreation

Sub-regional Basin Name and Code:
Coginchaug River, 4607

Regional Basin: Mattabesset River

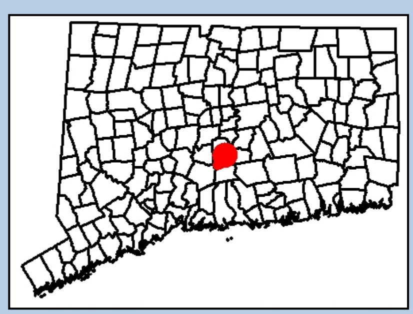
Major Basin: Connecticut

Watershed Area (acres): 18,129

MS4 Applicable? Yes

Applicable Season: Recreation Season (May 1 to September 30)

Figure 1: Watershed location in Connecticut



Middlefield (Figure 2).

Lyman Meadows Brook (CT4607-08_01) begins at the outlet of South Street Pond north of South Street in Middlefield, flows east crossing under the railroad tracks, Route 157, and Route 147, and ends at the confluence with the Coginchaug River just downstream of Miller Road in Middlefield. Lyman Meadows Brook's impaired segment is 1.43 miles long and is located entirely within Middlefield.

The impaired segments of Laurel Brook, Wadsworth Falls Pond, and Lyman Meadows Brook have a water quality classification of A. Designated uses include potential drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, and industrial and agricultural water supply. These segments are impaired due to elevated bacteria concentrations, affecting the designated use of recreation. As there are no designated beaches on Laurel Brook or Lyman Meadow Brook, the specific recreation impairment is for non-designated swimming and other water contact related activities. There is a designated swimming beach on Wadsworth Falls Park Pond, and the specific recreation impairment is for designated swimming and other water contact -related activities.

All segments listed on the Coginchaug River in Table 1 as not supporting for recreation and not included in this TMDL document were previously given load reductions. These calculations and supporting information can be found in the 2005 Mattabesset Regional TMDL http://www.ct.gov/dep/lib/dep/water/tmdl/tmdl_final/mattbasintmdlfinal.pdf.

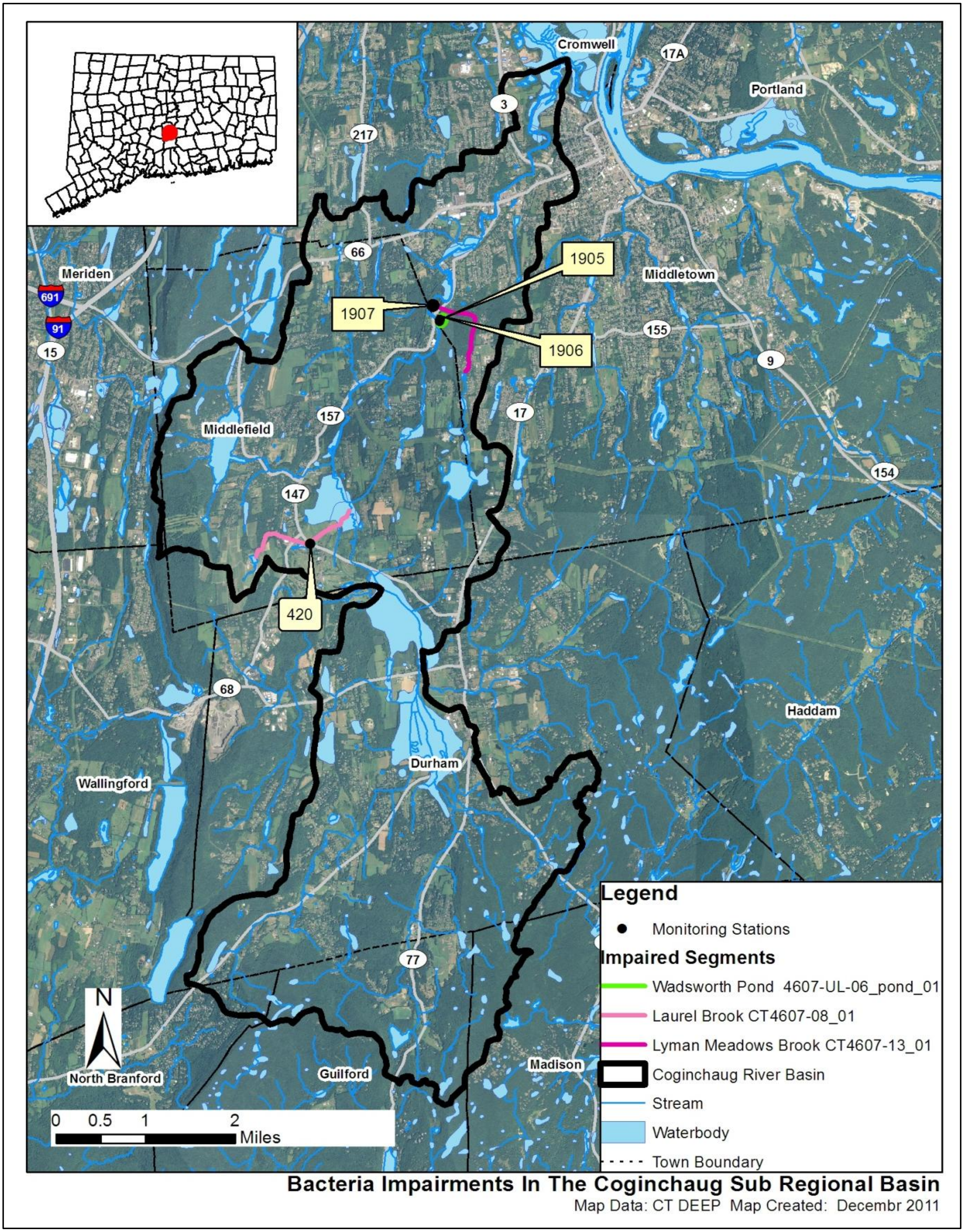
Table 1: Impaired Segments and nearby Waterbodies from the Connecticut 2010 Integrated Water Quality Report

Waterbody ID	Waterbody Name	Location	Miles/ Acres	Aquatic Life	Recreation	Fish Consumption
CT4607-00-UL_pond_01	Wadsworth Falls Park Pond (Middletown)	Small pond within Wadsworth Falls State Park, between mouths of Laurel Brook and Wadsworth Brook, Middlefield.	1.37	U	NOT	U
CT4607-00_01	Coginchaug River-01	From mouth at Mattebessett River (at Cromwell border), US to downstream side of Route 3 crossing, Middletown.	1.87	U	U	FULL
CT4607-00_02	Coginchaug River-02	From downstream side of Route 3 crossing, US to downstream side of Route 66 crossing (just US of Veterans Memorial Park), Middletown.	0.75	U	NOT	FULL
CT4607-00_03	Coginchaug River-03	From downstream side of Route 66 crossing (just US of Veterans Memorial Park), US to Starr Mill Pond dam, Middletown.	0.6	U	NOT	FULL
CT4607-00_04	Coginchaug River-04	From Starr Mill Pond Inlet, US (past Wadsworth Falls) to Strictland Road crossing, Middlefield.	4.19	U	NOT	FULL

Table 1: Impaired Segments and nearby Waterbodies from the Connecticut 2010 Integrated Water Quality Report (continued)

Waterbody ID	Waterbody Name	Location	Miles/ Acres	Aquatic Life	Recreation	Fish Consumption
CT4607-00_05	Coginchaug River-05	From Strictland Road crossing, Middlefield, US to Meeting House Hill Road crossing, Durham.	4.95	U	NOT	FULL
CT4607-00_06	Coginchaug River-06	From Meeting House Hill Road crossing, Durham, US to headwaters (US of Route 72 crossing, between Bluff Head and Broomstick Ledges), North Guilford.	3.59	FULL	NOT	FULL
CT4607-08_01	Lyman Meadows Brook (Middlefield)-01	Mouth on Coginchaug River, US of Coginchaug River crossing of Miller Road, US to outlet of South Street Pond, US of Railroad crossing, Middlefield.	1.43	U	NOT	FULL
CT4607-13_01	Laurel Brook (Middletown)-01	Mouth on Coginchaug River, in Wadsworth Falls State Park, parallel to swimming area, near Route 157, US to unnamed pond outlet, just US of Red Road crossing, Middletown.	1.17	U	NOT	FULL
Shaded cells indicate impaired segment addressed in this TMDL **FULL = Designated Use Fully Supported** **NOT = Designated Use Not Supported** **U = Unassessed**						

Figure 2: GIS map featuring general information of the Coginchaug River watershed at the sub-regional level



Land Use

Existing land use can affect the water quality of waterbodies within a watershed (USEPA, 2011c). Natural processes, such as soil infiltration of stormwater and plant uptake of water and nutrients, can occur in undeveloped portions of the watershed. As impervious surfaces (such as rooftops, roads, and sidewalks) increase within the watershed landscape from commercial, residential, and industrial development, the amount of stormwater runoff to waterbodies also increases. These waterbodies are negatively affected as increased pollutants from nutrients and bacteria from failing and insufficient septic systems, oil and grease from automobiles, and sediment from construction activities become entrained in this runoff. Agricultural land use activities, such as fertilizer application and manure from livestock, can also increase pollutants in nearby waterbodies (USEPA, 2011c).

As shown in Figures 3 and 4, the Coginchaug River watershed consists of 41% forest, 32% urban area, 9% water, and 18% agriculture. The area surrounding the impaired segment of the Laurel Brook is dominated by urban and forested land uses. There appear to be multiple subdivisions that have taken the place of agricultural and forested lands in the recent years, particularly along the impaired segment of Laurel Brook in Middletown and Middlefield. The area surrounding the impaired segment of Wadsworth Falls Pond is characterized by forested and urban land uses in Middletown and Middlefield. The area surrounding the impaired segment of Lyman Meadows Brook is dominated by agricultural and urban land uses. There are several large scale agricultural operations adjacent to Lyman Meadows Brook in Middlefield.

Figure 3: Land use within the Coginchaug River watershed

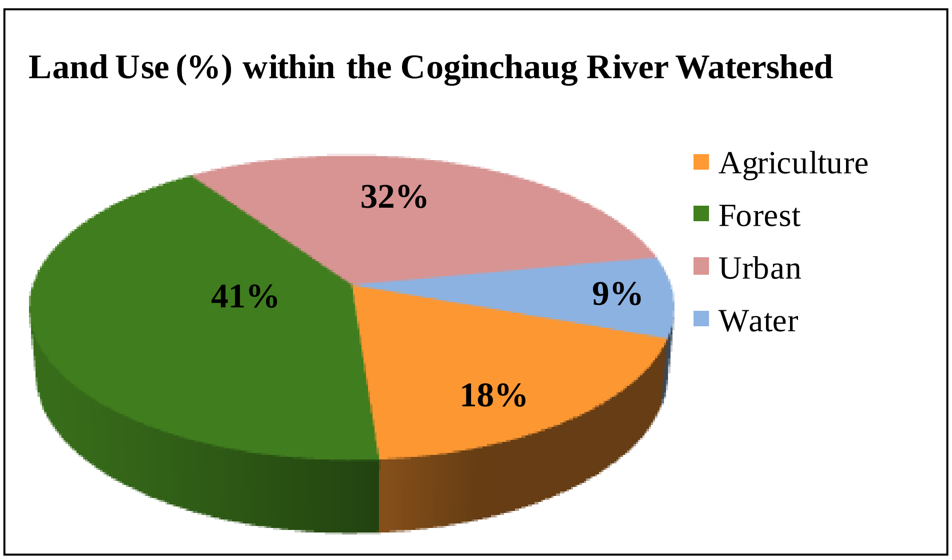
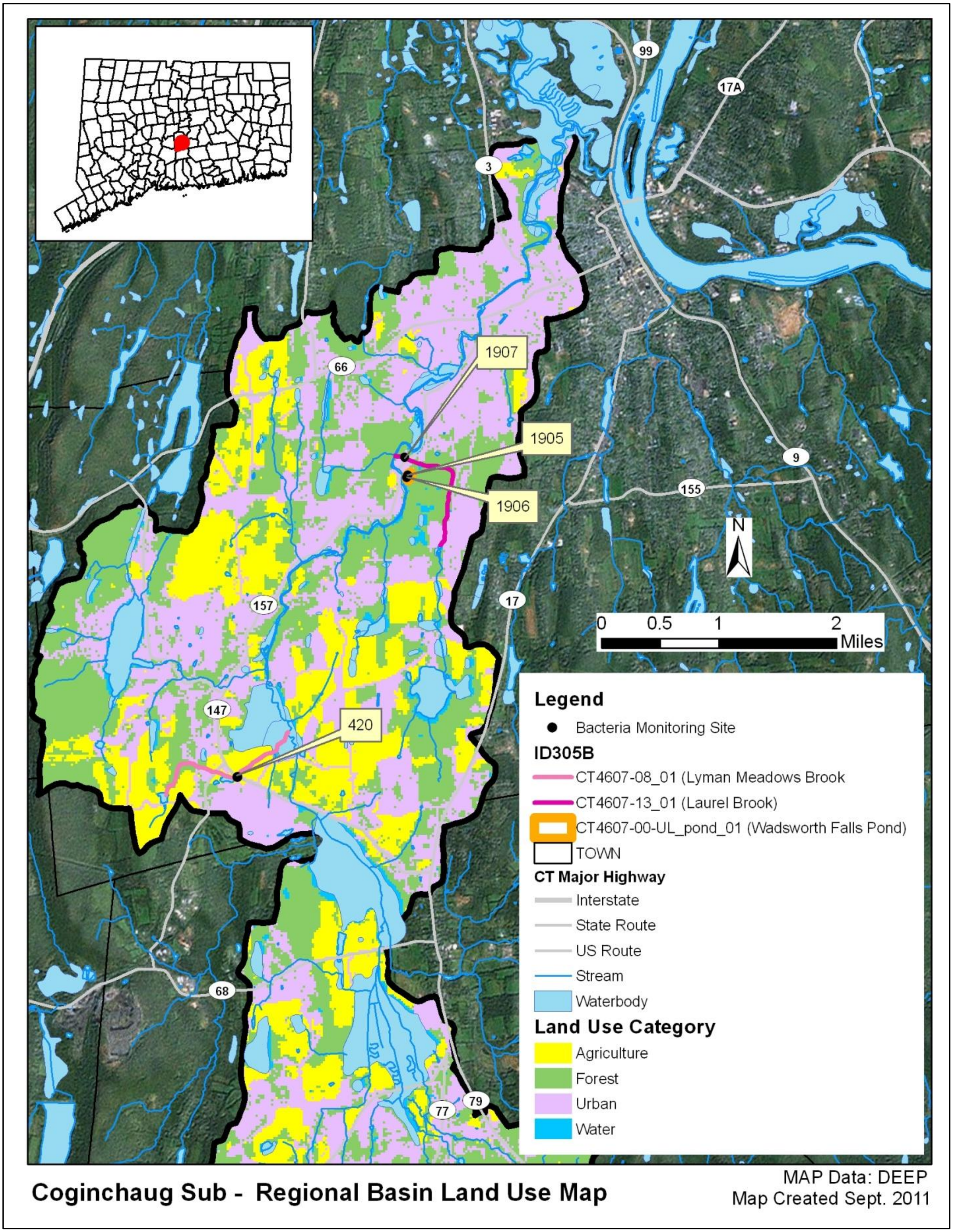


Figure 4: GIS map featuring land use for the Coginchaug River watershed at the sub-regional level



WHY IS A TMDL NEEDED?

E. coli is the indicator bacteria used for comparison with the CT State criteria in the CT Water Quality Standards (WQS) (CTDEEP, 2011). All data results are from CT DEEP, USGS, Bureau of Aquaculture, or volunteer monitoring efforts at stations located on the impaired segments.

Table 2: Sampling station location description for impaired segments in the Coginchaug River watershed

Waterbody ID	Waterbody Name	Station	Station Description	Municipality	Latitude	Longitude
CT4607-13_01	Laurel Brook	1907	crossing at lower end of parking lot close to mouth	Middletown	41.536120	-72.686010
CT4607-00-UL_pond_01	Wadsworth Falls State Park Swimming Pond	1906	Lifeguard Chair(s)	Middlefield	41.535234	-72.685669
CT4607-00-UL_pond_01	Wadsworth Falls State Park Swimming Pond	1905	Lifeguard Chairs	Middlefield	41.535492	-72.685519
CT4607-08_01	Lyman Meadows Brook	420	Route 147	Middlefield	41.498242	-72.713483

Laurel Brook (CT4607-13_01), Wadsworth Falls Pond (CT4607-00-UL_pond_01), and Lyman Meadows Brook (CT4607-08_01) are Class A freshwater waterbodies (Figures 5 and 6). Their applicable designated uses are potential drinking water supplies, habitat for fish and other aquatic life and wildlife, recreation, navigation, and industrial and agricultural water supply. Water quality analyses were conducted using data from one sampling location on Laurel Brook (Station 1907), two sampling locations on Wadsworth Falls Pond (Stations 1906 and 1905), and one station on Lyman Meadows Brook (Station 420) (Table 2).

For Laurel Brook, water quality criteria for *E. coli*, along with bacteria sampling results from 2001-2002 and 2004-2011, are presented in Table 10. Single sample values at Station 1907 on Laurel Brook exceeded the WQS for *E. coli* at least once in every sample year except 2001, 2002, 2005, and 2011. The annual geometric mean was calculated for Station 1907 and exceeded the WQS for *E. coli* in 2004, 2006, 2007, 2008, 2009, and 2010.

For Wadsworth Falls Pond, water quality criteria for *E. coli*, along with bacteria sampling results from 2003-2011, are presented in Table 11. For Station 1906, single sample values exceeded the WQS for *E. coli* at least once in 2003, 2007, 2008, 2009, and 2010. For Station 1905, single sample single sample values exceeded the WQS for *E. coli* at least once in 2003, 2005, 2007, 2008, and 2010. The annual geometric mean was calculated for Station 1906 and Station 1905 and did not exceed the WQS for *E. coli* at either station in any of the sample years.

For Lyman Meadow Brook, water quality criteria for *E. coli*, along with bacteria sampling results from 1998 and 2008, are presented in Table 12. Single sample values at Station 420 exceeded the WQS for *E. coli* on every sample taken in 1998 and 2008. The annual geometric mean was calculated for Station 420 and exceeded the WQS for *E. coli* in 1998 and 2008.

To aid in identifying possible bacteria sources, the geometric mean was also calculated for each station for wet-weather and dry-weather sampling days (Tables 10-12). For Station 1907 on Laurel Brook, the geometric means during wet and dry-weather exceeded the WQS for *E. coli*. For Station 1907, the geometric mean during wet-weather was more than three times greater than dry-weather. For Stations 1906 and 1905 on Wadsworth Falls Pond, the geometric mean did not exceed the WQS for *E. coli* during wet or dry-weather. For Station 420 on Lyman Meadow Brook, the geometric mean during wet-weather exceeded the WQS for *E. coli*. The geometric mean for dry-weather could not be calculated for Station 420 due to insufficient data.

Due to the elevated bacteria measurements presented in Tables 10-12, these impaired segments did not meet CT's bacteria WQS, were identified as impaired, and were placed on the CT List of Waterbodies Not Meeting Water Quality Standards, also known as the CT 303(d) Impaired Waters List. The Clean Water Act requires that all 303(d) listed waters undergo a TMDL assessment that describes the impairments and identifies the measures needed to restore water quality. The goal is for all waterbodies to comply with State WQS.

Figure 5: Aerial map of Laurel Brook and Wadsworth Falls Pond in the Coginchaug River watershed

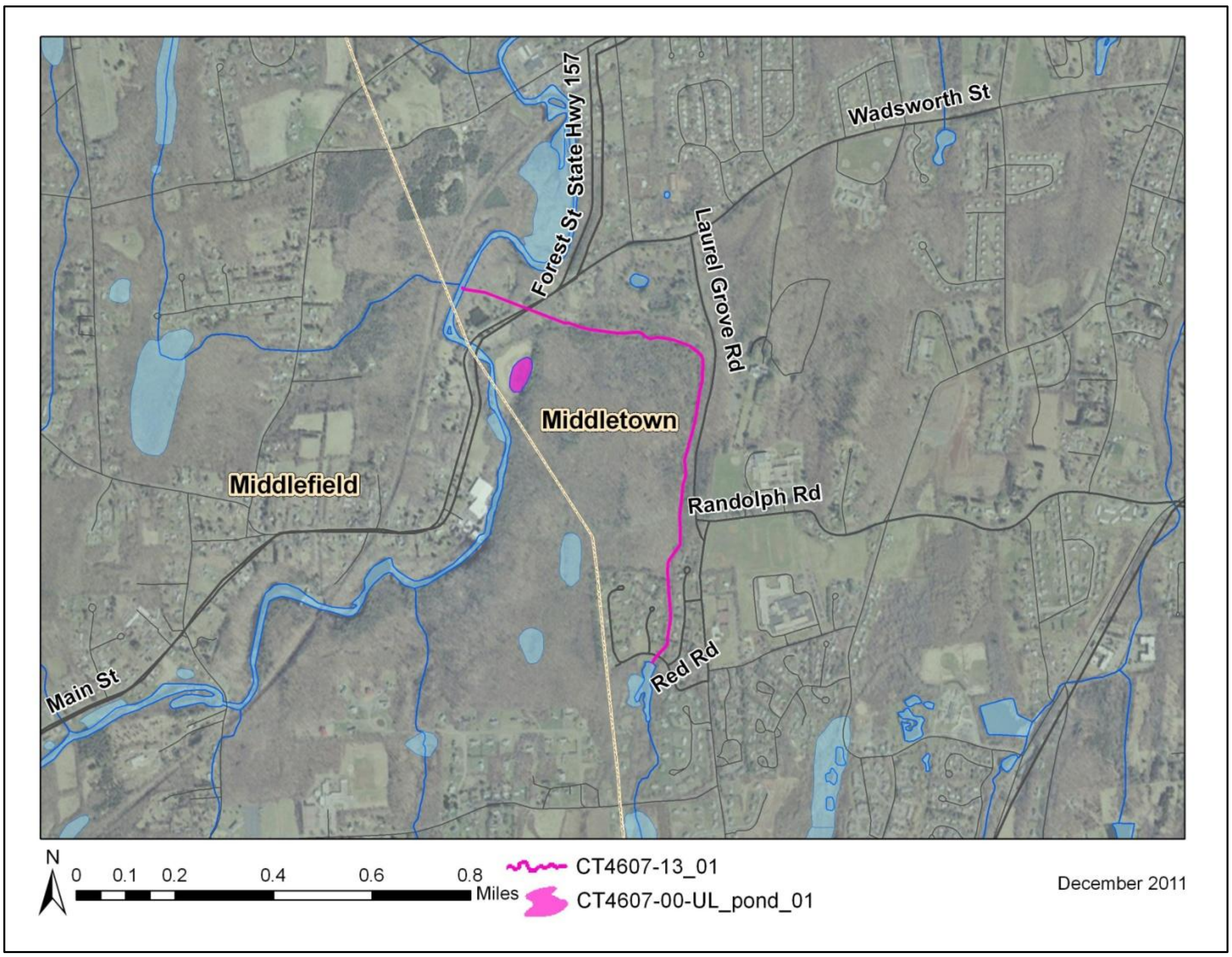
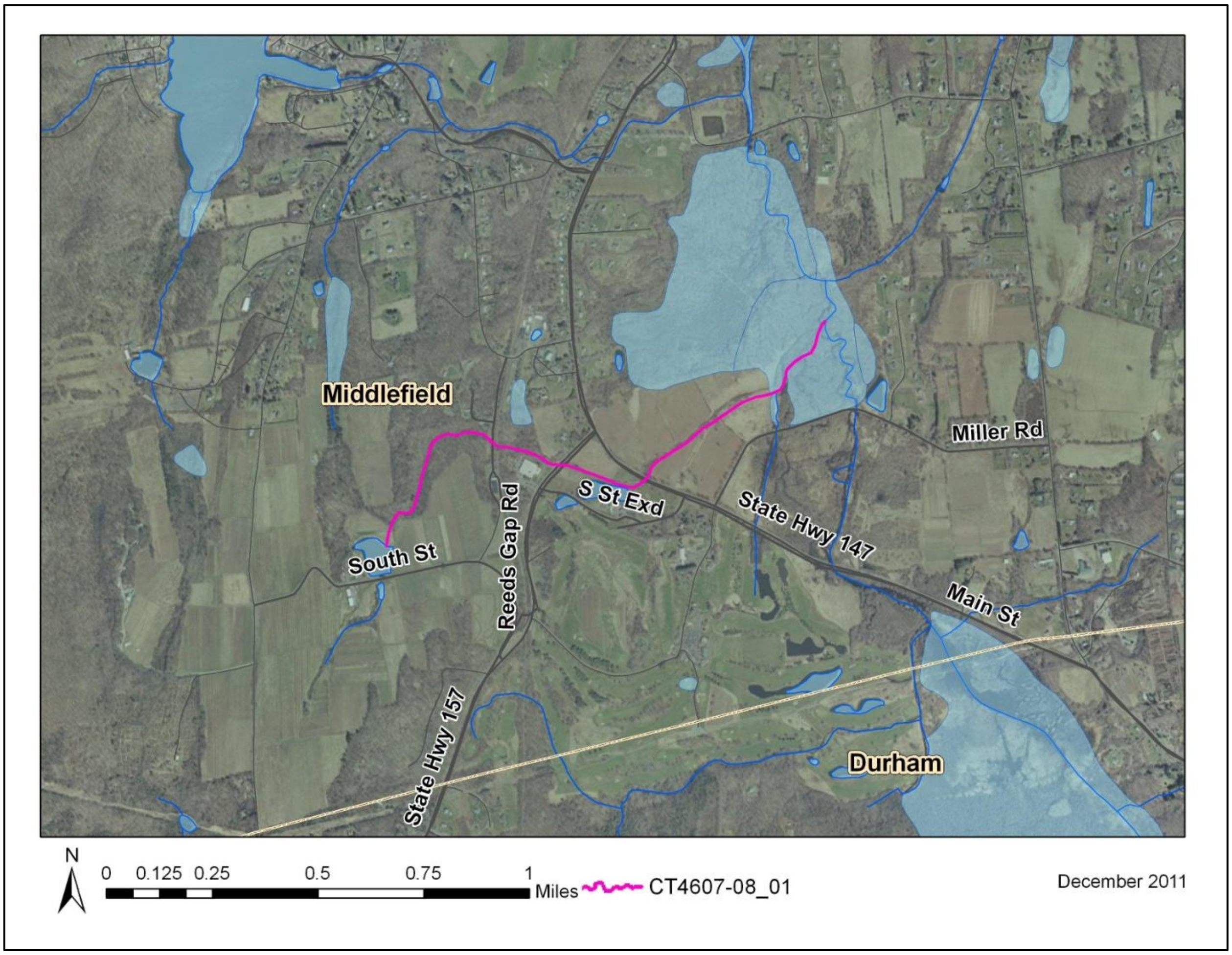


Figure 6: Aerial map of Lyman Meadows Brook in the Coginchaug River watershed



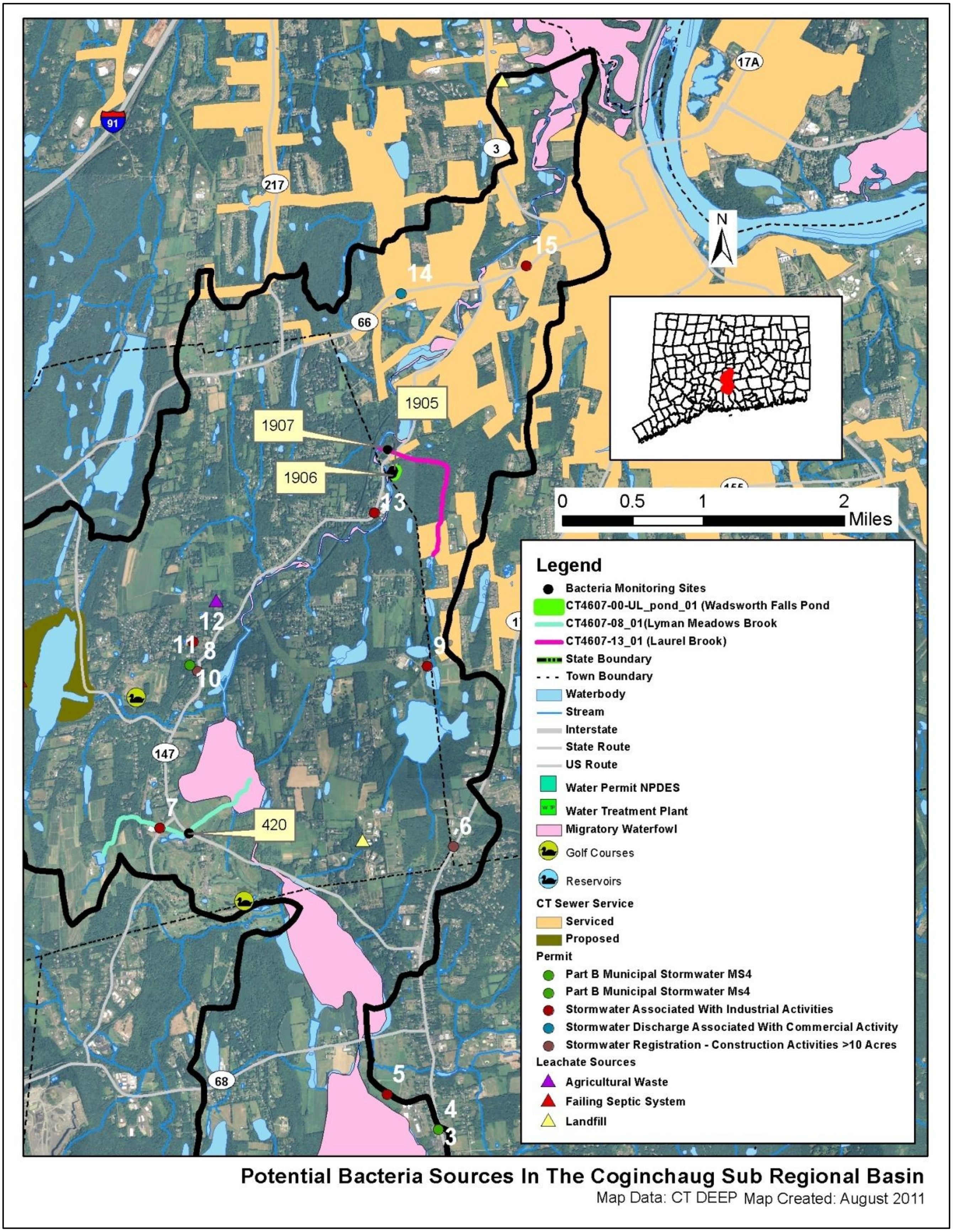
POTENTIAL BACTERIA SOURCES

Potential sources of indicator bacteria in a watershed include point and non-point sources, such as stormwater runoff, agriculture, sanitary sewer overflows (collection system failures), illicit discharges, and inappropriate discharges to the waterbody. Potential sources that have been tentatively identified in the watershed based on land use (Figures 3 and 4) and a collection of local information for the impaired waterbody is presented in Table 3 and Figure 7. However, the list of potential sources is general in nature and should not be considered comprehensive. There may be other sources not listed here that contribute to the observed water quality impairment in the study segments. Further monitoring and investigation will confirm listed sources and discover additional ones. Some segments in this watershed are currently listed as unassessed by CT DEEP procedures. This does not suggest that there are no potential issues on this segment, but indicates a lack of current data to evaluate the segment as part of the assessment process. For some segments, there are data from permitted sources, and CT DEEP recommends that any elevated concentrations found from those permitted sources be addressed through voluntary reduction measures. More detailed evaluation of potential sources is expected to become available as activities are conducted to implement these TMDLs.

Table 3: Potential bacteria sources in the Coginchaug River watershed

Impaired Segment	Permit Source	Illicit Discharge	CSO/ SSO Issue	Failing Septic System	Agricultural Activity	Stormwater Runoff	Nuisance Wildlife/ Pets	Other
Laurel Brook CT4607-13_01	x	x		x		x	x	
Wadsworth Falls Pond CT4607-00-UL_pond_01	x	x		x		x	x	
Lyman Meadows Brook CT4607-08_01	x			x	x	x	x	

Figure 7: Potential sources in the Coginchaug River watershed at the sub-regional level



The potential sources map for the impaired basin was developed after thorough analysis of available data sets. If information is not displayed in the map, then no sources were discovered during the analysis. The following is the list of potential sources that were evaluated: problems with migratory waterfowl, golf course locations, reservoirs, proposed and existing sewer service, cattle farms, poultry farms, permitted sources of bacteria loading (surface water discharge, MS4 permit, industrial stormwater, commercial stormwater, groundwater permits, and construction related stormwater), and leachate and discharge sources (agricultural waste, CSOs, failing septic systems, landfills, large septic tank leach fields, septage lagoons, sewage treatment plants, and water treatment or filter backwash).

Point Sources

Permitted sources within the watershed that could potentially contribute to the bacteria loading are identified in Table 4. This table includes permit types that may or may not be present in the impaired watershed. A list of active permits in the watershed is included in Table 5. Additional investigation and monitoring may reveal the presence of additional discharges in the watershed. Available effluent data from each of these permitted categories found within the watershed are compared to the CT State WQS for the appropriate receiving waterbody use and type. When available, bacteria data results from these permitted sources are listed in Tables 6 and 7.

Table 4: General categories list of other permitted discharges

Permit Code	Permit Description Type	Number in watershed
CT	Surface Water Discharges	0
GPL	Discharge of Swimming Pool Wastewater	0
GSC	Stormwater Discharge Associated with Commercial Activity	1
GSI	Stormwater Associated with Industrial Activity	4
GSM	Part B Municipal Stormwater MS4	2
GSN	Stormwater Registration – Construction	2
LF	Groundwater Permit (Landfill)	0
UI	Underground Injection	0

Permitted Sources

As shown in Table 5, there are multiple permitted discharges in the Coginchaug River watershed. Bacteria data from 2001 – 2003 from several of these industrial permitted facilities are included in Table 6. Though this data cannot be compared to a water quality standard as there is no recreation standard for fecal coliform bacteria, multiple samples were high with readings exceeding 1,000 colonies/100 mL from Rogers Manufacturing (GSI000697). Since the MS4 permits are not targeted to a specific location, but the geographic area of the regulated municipality, there is no one accurate location on the map to display the location of these permits. One dot will be displayed at the geographic center of the municipality as a reference point. Sometimes this location falls outside of the targeted watershed and therefore the MS4 permit will not be displayed in the Potential Sources Map. Using the municipal border as a guideline will show which areas of an affected watershed are covered by an MS4 permit.

Table 5: Permitted facilities within the Coginchaug River watershed

Town	Client	Permit ID	Permit Type	Site Name/Address	Map#
Middlefield	Town Of Middlefield	GSM000069	Part B Municipal Stormwater Ms4	Middlefield, Town Of	10
Middlefield	Cooper-Atkins Corp.	GSI002190	Stormwater Associated With Industrial Activities	Cooper Atkins Corporation	7
Middlefield	Zygo Corporation	GSI000262	Stormwater Associated With Industrial Activities	Zygo Corporation	9
Middlefield	Town Of Middlefield	GSI002285	Stormwater Associated With Industrial Activities	Town Of Middlefield Public Works Facility	12
Middlefield	The Lyman Farm Inc	GSN002207	Stormwater Registration - Construction Activities >10 Acres	Golf Center At Lyman Orchards	8
Middletown	City Of Middletown	GSM000011	Part B Municipal Stormwater Ms4	Middletown, City Of	NA
Middletown	City Of Middletown	GSI001141	Stormwater Associated With Industrial Activities	Middletown Public Works Garage	15
Middletown	Home Depot U. S. A., Inc.	GSC000266	Stormwater Discharge Associated With Commercial Activity	Home Depot Store #6233	14
Middletown	Linda D Wilson, Ralph E Wilson	GSN001677	Stormwater Registration - Construction Activities >10 Acres	Majestic Oak Estates	6

Table 6: Industrial permits in the Coginchaug River watershed and available fecal coliform data (colonies/100mL). The result cannot be compared to the water quality standard as there is no recreation standard for fecal coliform.

Town	Location	Permit Number	Receiving Water	Sample Location	Sample Date	Result
Middlefield	Rogers Mfg	GSI000697	Coginchaug River	swale	08/20/01	3,900
Middlefield	Rogers Mfg	GSI000697	Coginchaug River	swale	09/16/02	1,210
Middlefield	Zygo Corp	GSI000262	Laurel Brook	detention pond outlet #001	11/20/01	40
Middletown	B.F.Goodrich Aerospace	GSI000259	Coginchaug River	6" PVC Pipe-outfall to river	05/28/02	180

Municipal Stormwater Permitted Sources

Per the EPA Phase II Stormwater rule all municipal storm sewer systems (MS4s) operators located within US Census Bureau Urbanized Areas (UAs) must be covered under MS4 permits regulated by the appropriate State agency. There is an EPA waiver process that municipalities can apply for to not participate in the MS4 program. In Connecticut, EPA has granted such waivers to 19 municipalities. All participating municipalities within UAs in Connecticut are currently regulated under MS4 permits by CT DEEP staff in the MS4 program.

The US Census Bureau defines a UA as a densely settled area that has a census population of at least 50,000. A UA generally consists of a geographic core of block groups or blocks that exceeds the 50,000 people threshold and has a population density of at least 1,000 people per square mile. The UA will also include adjacent block groups and blocks with at least 500 people per square mile. A UA consists of all or part of one or more incorporated places and/or census designated places, and may include additional territory outside of any place. (67 FR 11663)

For the 2000 Census a new geographic entity was created to supplement the UA blocks of land. This created a block known as an Urban Cluster (UC) and is slightly different than the UA. The definition of a UC is a densely settled area that has a census population of 2,500 to 49,999. A UC generally consists of a geographic core of block groups or blocks that have a population density of at least 1,000 people per square mile, and adjacent block groups and blocks with at least 500 people per square mile. A UC consists of all or part of one or more incorporated places and/or census designated places; such a place(s) together with adjacent territory; or territory outside of any place. The major difference is the total population cap of 49,999 people for a UC compared to >50,000 people for a UA. (67 FR 11663)

While it is possible that CT DEEP will be expanding the reach of the MS4 program to include UC municipalities in the near future they are not currently under the permit. However, the GIS layers used to create the MS4 maps in this Statewide TMDL did include both UA and UC blocks. This factor creates some municipalities that appear to be within an MS4 program that are not currently regulated through an MS4 permit. This oversight can explain a municipality that is at least partially shaded grey in the maps and there are no active MS4 reporting materials or information included in the appropriate appendix. While these areas are not technically in the MS4 permit program, they are still considered urban by the cluster definition above and are likely to contribute similar stormwater discharges to affected waterbodies covered in this TMDL.

As previously noted, EPA can grant a waiver to a municipality to preclude their inclusion in the MS4 permit program. One reason a waiver could be granted is a municipality with a total population less than 1000 people, even if the municipality was located in a UA. There are 19 municipalities in Connecticut that have received waivers, this list is: Andover, Bozrah, Canterbury, Coventry, East Hampton, Franklin, Haddam, Killingworth, Litchfield, Lyme, New Hartford, Plainfield, Preston, Salem, Sherman, Sprague, Stafford, Washington, and Cromwell. There will be no MS4 reporting documents from these towns even if they are displayed in an MS4 area in the maps of this document.

The list of US Census UCs is defined by geographic regions and is named for those regions, not necessarily by following municipal borders. In Connecticut the list of UCs includes blocks in the following Census Bureau regions: Colchester, Danielson, Lake Pocotopaug, Plainfield, Stafford, Storrs, Torrington, Willimantic, Winsted, and the border area with Westerly, RI (67 FR 11663). Any MS4 maps showing these municipalities may show grey areas that are not currently regulated by the CT DEEP MS4 permit program.

The impaired segments in the Coginchaug River watershed are located within the Town of Middlefield, and City of Middletown, CT. Middlefield and Middletown are designated urban areas, as defined by the U.S. Census Bureau, and are required to comply with the General Permit for the Discharge of Stormwater from Small Municipal Storm Sewer Systems (MS4 permit) issued by the Connecticut Department of Energy and Environmental Protection (DEEP) (Figure 8). This general permit is only applicable to municipalities that are identified in Appendix A of the MS4 permit that contain designated urban areas and discharge stormwater via a separate storm sewer system to surface waters of the State. The permit requires municipalities to develop a Stormwater Management Plan (SMP) to reduce the discharge of pollutants as well as to protect water quality. The MS4 permit is discussed further in the "TMDL

Implementation Guidance" section of the core TMDL document. Additional information regarding stormwater management and the MS4 permit can be obtained on CTDEEP's website (http://www.ct.gov/dep/cwp/view.asp?a=2721&q=325702&depNav_GID=1654).

Multiple MS4 outfalls that discharge to the Coginchaug River in Middlefield and Middletown have been sampled for *E. coli* bacteria (Table 7). In Middlefield, 11 MS4 outfalls were sampled in 2006, 2008, or 2011 for a total of 30 samples. Of these outfalls, 9 of the 11 exceeded the single sample water quality standard of 410 colonies/100 mL on at least one sample date. In all, 11 out of 30 (37%) of the samples exceeded the single sample water quality standard of 410 colonies/100 mL. In Middletown, 10 MS4 outfalls were sampled in 2008 for a total of 11 samples. Of these outfalls, 8 of the 10 exceeded the single sample water quality standard of 410 colonies/100 mL on at least one sample date. In all, eight out of 11 (73%) of the samples exceeded the single sample water quality standard of 410 colonies/100 mL. These MS4 outfalls sampled in Middlefield and Middletown do not discharge directly to the impaired segments of Laurel Brook, Wadsworth Falls Pond, or Lyman Meadows Brook. However, the results indicate that MS4 outfalls within the watershed may be contributing bacteria to the receiving waters.

Figure 8: MS4 areas of the Coginchaug River watershed

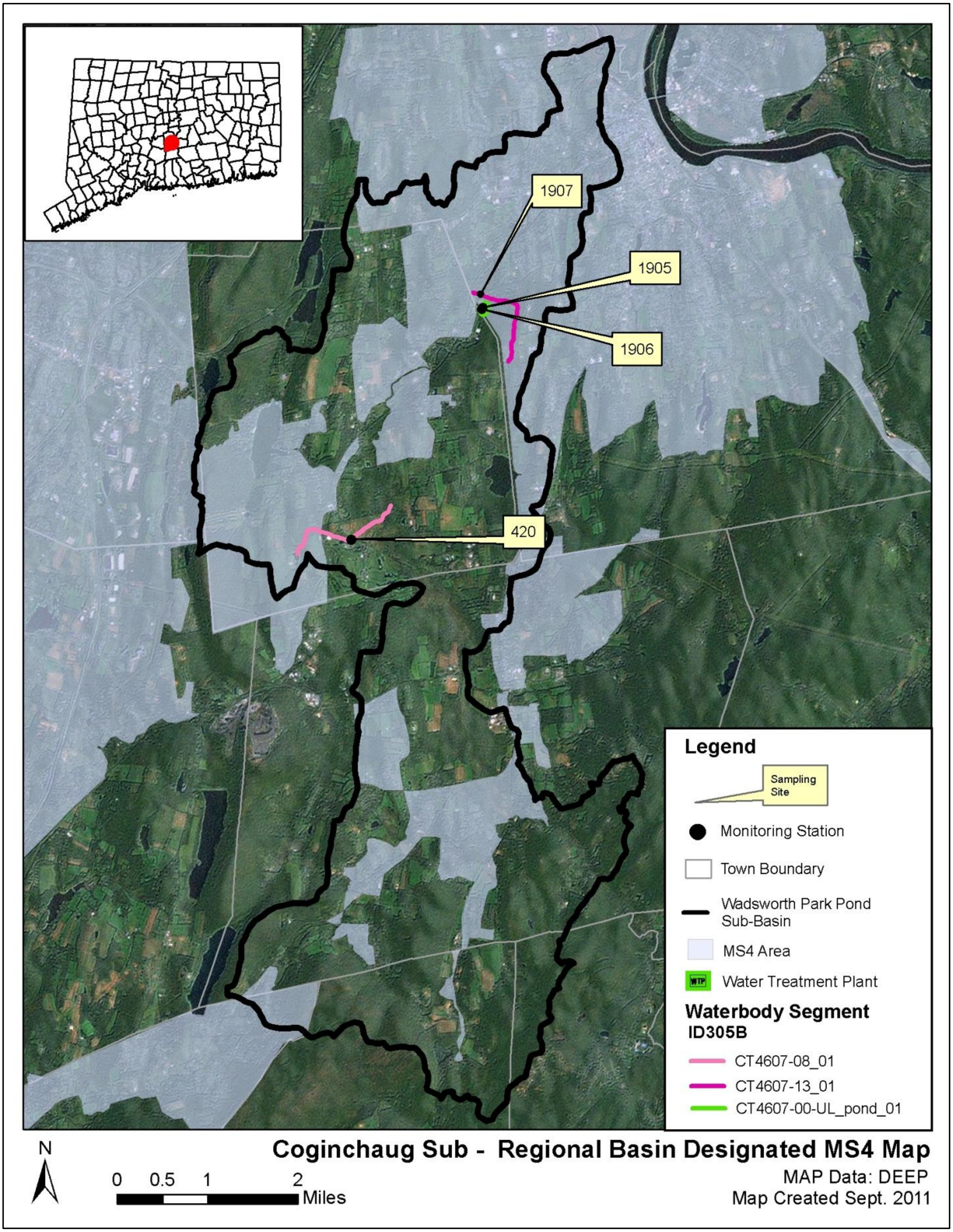


Table 7: List of MS4 sample locations and *E. coli* (colonies/100 mL) results in the Housatonic River watershed

Town	Location	MS4 Type	Receiving Waters	Sample Date	Result
Middlefield	I-1 (41°30’02”N 72°41’21”W)	Industrial	Coginchaug River	11/16/11	290
Middlefield	I-2 (41°29’55”N 72°41’24”W)	Industrial	Coginchaug River	11/16/11	30
Middlefield	MI-1 (41°30’02”N 72°41’21”W)	Industrial	Coginchaug River	11/02/06	240
Middlefield	MI-1 (41°30’02”N 72°41’21”W)	Industrial	Coginchaug River	12/01/06	60
Middlefield	MI-1 (41°30’02”N 72°41’21”W)	Industrial	Coginchaug River	01/11/08	20
Middlefield	MI-1 (41°30’02”N 72°41’21”W)	Industrial	Coginchaug River	04/28/08	50
Middlefield	MI-2 (41°29’55”N 72°41’24”W)	Industrial	Coginchaug River	11/02/06	300
Middlefield	MI-2 (41°29’55”N 72°41’24”W)	Industrial	Coginchaug River	12/01/06	380
Middlefield	MI-2 (41°29’55”N 72°41’24”W)	Industrial	Coginchaug River	01/11/08	140
Middlefield	MI-2 (41°29’55”N 72°41’24”W)	Industrial	Coginchaug River	04/28/08	10
Middlefield	MR-1 (41°30’18”N 72°41’21”W)	Residential	Coginchaug River	12/01/06	400
Middlefield	MR-1 (41°30’18”N 72°41’21”W)	Residential	Coginchaug River	01/11/08	640
Middlefield	MR-1 (41°30’18”N 72°41’21”W)	Residential	Coginchaug River	04/28/08	250
Middlefield	MR-1 (41°31’18”N 72°41’21”W)	Residential	Coginchaug River	11/02/06	>1200
Middlefield	MR2 (41°31’31”N 72°41’21”W)	Residential	Coginchaug River	11/02/06	140
Middlefield	MR-2 (41°31’31”N 72°41’21”W)	Residential	Coginchaug River	12/01/06	430
Middlefield	MR-2 (41°31’31”N 72°41’21”W)	Residential	Coginchaug River	01/11/08	280
Middlefield	MR-2 (41°31’31”N 72°41’21”W)	Residential	Coginchaug River	04/28/08	40
Middlefield	MR-3 (41°31’30”N 72°41’21”W)	Industrial	Coginchaug River	11/02/06	20
Middlefield	MR-3 (41°31’30”N 72°41’21”W)	Residential	Coginchaug River	12/01/06	>2000
Middlefield	MR-3 (41°31’30”N 72°41’21”W)	Residential	Coginchaug River	01/11/08	20
Middlefield	MR-3 (41°31’30”N 72°41’21”W)	Residential	Coginchaug River	04/28/08	>2000
Middlefield	MR-4 (41°31’57”N 72°42’55”W)	Residential	Coginchaug River	11/02/06	520
Middlefield	MR-4 (41°31’57”N 72°42’55”W)	Residential	Coginchaug River	12/01/06	>600
Middlefield	MR-4 (41°31’57”N 72°42’55”W)	Residential	Coginchaug River	01/11/08	140
Middlefield	MR-4 (41°31’57”N 72°42’55”W)	Residential	Coginchaug River	04/28/08	>600
Middlefield	R-1 (41°31’18”N 72°41’42”W)	Residential	Coginchaug River	11/16/11	5,480
Middlefield	R-2 (41°31’31”N 72°41’21”W)	Residential	Coginchaug River	11/16/11	300
Middlefield	R-3 (41°31’30”N 72°41’21”W)	Residential	Coginchaug River	11/16/11	1,520
Middlefield	R-4 (41°31’57”N 72°42’55”W)	Residential	Coginchaug River	11/16/11	8,660
Middletown	Bernie Orourke Dr	Commercial	Coginchaug River	09/26/08	579
Middletown	Beverly Heights (pipe from CB)	Commercial	Coginchaug River	11/05/08	50
Middletown	Boston Rd #1 (across from 277 Boston Road)	Industrial	Coginchaug River	11/05/08	1,610

Table 7: List of MS4 sample locations and *E. coli* (colonies/100 mL) results in the Housatonic River watershed (continued)

Town	Location	MS4 Type	Receiving Waters	Sample Date	Result
Middletown	Boston Road # 2 (across from 323 Boston Rd)	Residential	Coginchaug River	11/05/08	24,200
Middletown	Catherine St	Residential	Coginchaug River	09/26/08	2,420
Middletown	George St	Residential	Coginchaug River	09/26/08	2,420
Middletown	Johnson St	Industrial	Coginchaug River	09/26/08	1,733
Middletown	Keefe Lane (pipe from CB)	Industrial	Coginchaug River	11/05/08	60
Middletown	Middlefield St	Industrial	Coginchaug River	09/26/08	687
Middletown	Walnut Grove Rd	Residential	Coginchaug River	09/26/08	1,203
Middletown	Walnut Grove Rd	Residential	Coginchaug River	11/05/08	100
Shaded cells indicate an exceedance of single-sample based water quality criteria (410 colonies/100 mL)					

Non-point Sources

Non-point source pollution (NPS) comes from many diffuse sources and is more difficult to identify and control. NPS pollution is often associated with land-use practices. Examples of NPS that can contribute bacteria to surface waters include insufficient septic systems, pet and wildlife waste, agriculture, and contact recreation (swimming or wading). Potential sources of NPS within the Coginchaug River watershed are described below.

Stormwater Runoff from Developed Areas

Approximately 32% of the land use in the watershed is considered urban, and some of that area is concentrated around the impaired segments in the Towns of Middletown and Middlefield (Figure 4). Urban areas are often characterized by impervious cover, or surface areas such as roofs and roads that force water to run off land surfaces rather than infiltrate into the soil. Studies have shown a link between increasing impervious cover and degrading water quality conditions in a watershed (CWP, 2003). In one study, researchers correlated the amount of fecal coliform to the percent of impervious cover in a watershed (Mallin *et al.*, 2000).

Approximately 79% of the Coginchaug River watershed is characterized by 0-6% impervious cover, 9% is characterized by 7-11% impervious cover, and 12% is characterized by 12-15% impervious cover (Figures 9 and 10). The area adjacent to Laurel Brook has primarily 7-11% impervious cover with the area surrounding Station 1907 characterized by 12-15% impervious cover. The area surrounding Wadsworth Falls Pond and Lyman Meadows Brook has 0-6% impervious cover. There are also several areas with impervious surfaces close to the impaired segments. Laurel Grove Road runs parallel to Laurel Brook's impaired segment for a portion of its reach in Middletown. There is a large parking area adjacent to Wadsworth Falls Pond off Wadsworth Street in Middletown, and both Route 157 and Route 147 cross Lyman Meadows Brook in Middlefield. These impervious surfaces could potentially convey large amounts of stormwater runoff to the impaired segments during storm events. The proximity of some impervious surfaces to Laurel Brook, Wadsworth Falls Pond, and Lyman Meadows Brook indicate that stormwater runoff from developed areas is a potential source of bacterial contamination.

Figure 9: Range of impervious cover (%) in the Coginchaug River watershed

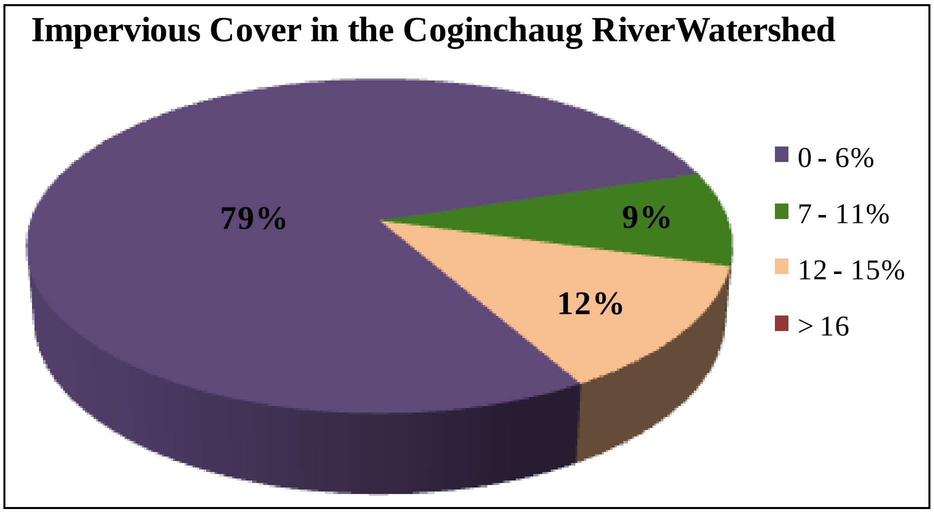
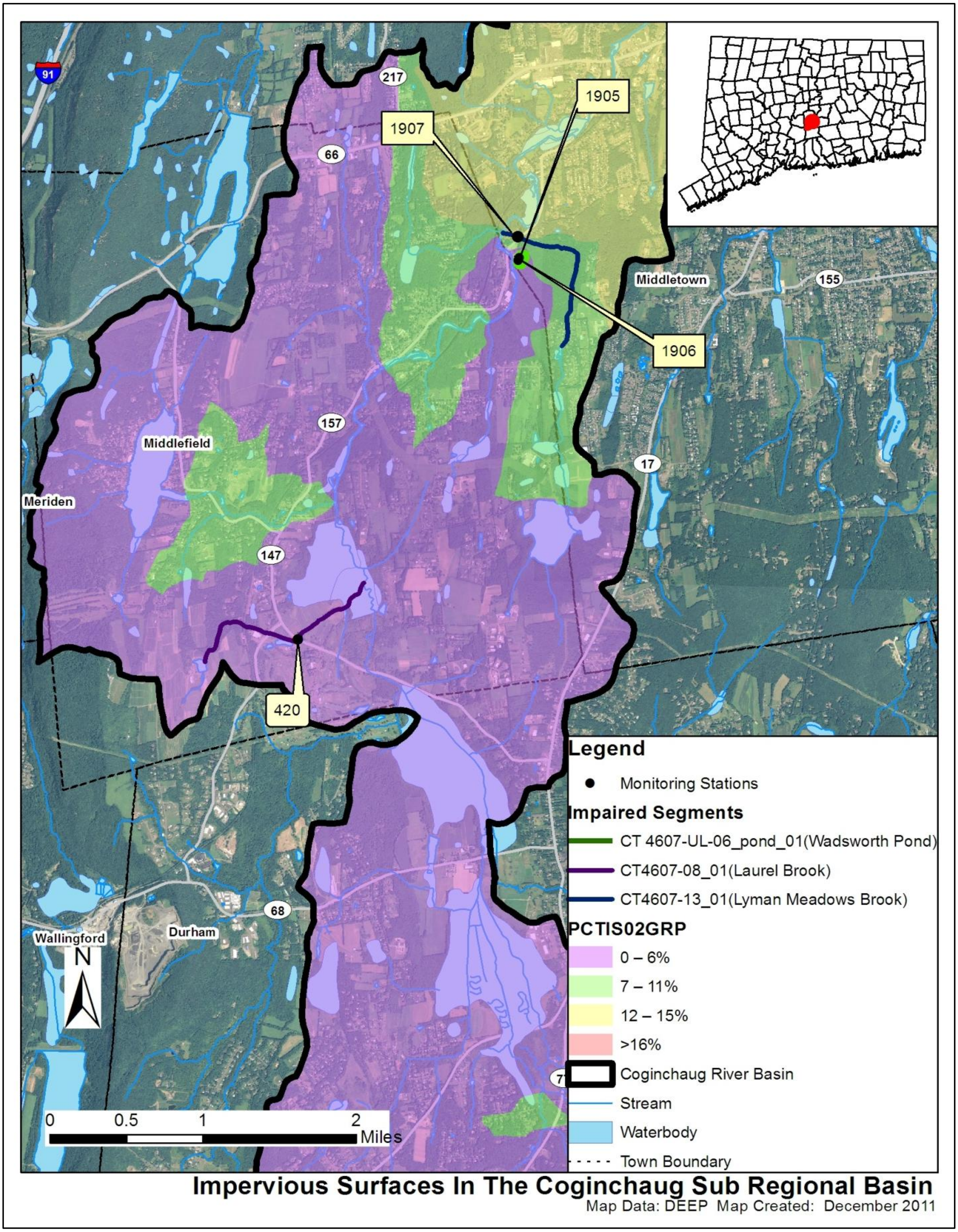


Figure 10: Impervious cover (%) for the Coginchaug River sub-regional watershed



Agricultural Activities

Agricultural operations are an important economic activity and landscape feature in many areas of the State. Runoff from agricultural fields may contain pollutants such as bacteria and nutrients (USEPA, 2011a). This runoff can include pollutants from farm practices such as storing manure, allowing livestock to wade in nearby waterbodies, applying fertilizer, and reducing the width of vegetated buffer along the shoreline. Agricultural land use makes up 18% of the Coginchaug River watershed (Figure 4). It does not appear as though there are any active agricultural operations near the impaired segment of Laurel Brook or Wadsworth Falls Pond. However, there are large agricultural lands adjacent to Lyman Meadows Brook off South Street, Main Street, and Miller Road in Middlefield. These agricultural lands near Lyman Meadows Brook may be carrying pollutants, including bacteria, into this impaired segment.

Insufficient Septic Systems and Illicit Discharges

As shown in Figure 7, only some of the areas surrounding Laurel Brook and Wadsworth Falls Pond have access to a sanitary sewer. Therefore, many businesses and residents in the areas without service rely on onsite wastewater treatment systems, such as septic systems. Insufficient or failing septic systems can be significant sources of bacteria by allowing raw waste to reach surface waters. In Connecticut, local health directors or health districts are responsible for keeping track of any reported insufficient or failing septic systems in a specific municipality. The Town of Middlefield has its own Health Department (http://www.middlefieldct.org/town-offices/land-use-office/sanitarian). The City of Middletown has its own Health Department as well (http://www.cityofmiddletown.com/content/117/121/149/).

There are multiple areas within the watershed with access to a sanitary sewer. Several subdivisions near Laurel Brook have access to a sanitary sewer, and there is a small portion of land near Wadsworth Falls Pond with access as well (Figure 7). Sewer system leaks and other illicit discharges located within near Laurel Brook and Wadsworth Falls Pond may be contributing bacteria to these waterbodies.

Wildlife and Domestic Animal Waste

Wildlife and domestic animals within the Coginchaug River watershed represent a potential source of bacteria. With the construction of roads and drainage systems, these wastes may no longer be retained on the landscape, but instead may be conveyed via stormwater to the nearest surface water. These physical land alterations can exacerbate the impact of natural sources on water quality (USEPA, 2001).

Open spaces located along the impaired segments may provide areas for waterfowl to congregate. Geese and other waterfowl are known to congregate in open areas including recreational fields, golf courses, and agricultural cropfields. The Vinal Technical School and Mercy High School recreational fields are located adjacent to Laurel Brook off Randolph Road in Middletown. Wadsworth Falls Pond has large grassed areas leading down to the water with no riparian buffer, making the grass an ideal area for waterfowl to congregate. The Lyman Orchards Golf Club is adjacent to Lyman Meadows Brook's impaired segment in Middlefield. In addition to creating a nuisance, large numbers of geese can also create unsanitary conditions on the grassed areas and cause water quality problems due to bacterial contamination associated with their droppings. Large populations of geese can also lead to habitat destruction as a result of overgrazing on wetland and riparian plants.

Residential development surrounds much of Laurel Brook's impaired segment and portions of Lyman Meadows Brook's impaired segment (Figures 5 and 6). When not properly disposed, waste from domestic animals such as dogs and horses can enter surface waters directly or through stormwater infrastructure.

Therefore, domestic animal waste may be contributing to bacteria concentrations in the impaired segment of Laurel Brook and Lyman Meadows Brook.

Additional Sources

There may be other sources not listed here or identified in Figure 7 that contribute to the observed water quality impairment in Laurel Brook. Further monitoring and investigation will confirm the listed sources and discover additional ones. More detailed evaluation of potential sources is expected to become available as activities are conducted to implement this TMDL.

Land Use/Landscape

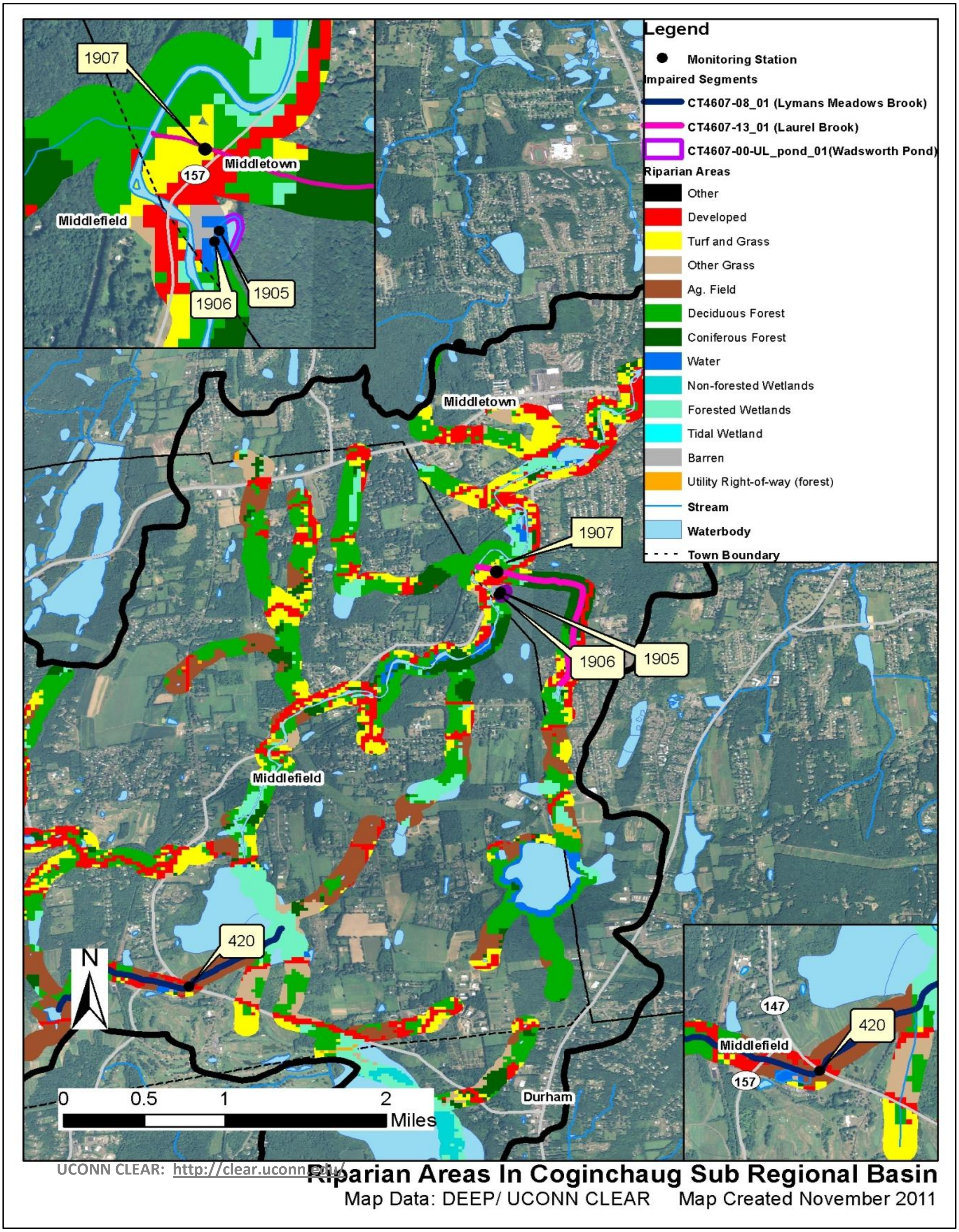
Riparian Buffer Zones

The riparian buffer zone is the area of land located immediately adjacent to streams, lakes, or other surface waters. The boundary of the riparian zone and the adjoining uplands is gradual and not always well-defined. However, riparian zones differ from uplands because of high levels of soil moisture, frequent flooding, and the unique assemblage of plant and animal communities found there. Through the interaction of their soils, hydrology, and vegetation, natural riparian areas influence water quality as contaminants are taken up into plant tissues, adsorbed onto soil particles, or modified by soil organisms. Any change to the natural riparian buffer zone can reduce the effectiveness of the natural buffer and has the potential to contribute to water quality impairment (USEPA, 2011b).

The CLEAR program at UCONN has created streamside buffer layers for the entire State of Connecticut (http://clear.uconn.edu/), which have been used in this TMDL. Analyzing this information can reveal potential sources and implementation opportunities at a localized level. The land use directly adjacent to a waterbody can have direct impacts on water quality from surface runoff sources.

The riparian zone for Laurel Brook's impaired segment is dominated by forested and developed areas (Figure 11). The riparian zone for Wadsworth Falls Pond is characterized by forested and grassed areas. The riparian zone for Lyman Meadows Brook is dominated by agricultural areas with pockets of development. Developed areas within the riparian zone likely contribute pollutants such as bacteria to the waterbody since the natural riparian buffer is not available to treat runoff. Grassed areas within the riparian zone provide a place for waterfowl and other wildlife to congregate. Agricultural areas within the riparian zone reduce the ability of vegetation to remove pollutants, including bacteria.

Figure 11: Riparian buffer zone information for the Coginchaug River watershed



CURRENT MANAGEMENT ACTIVITIES

The watershed community has developed and implemented programs to protect water quality from bacterial contamination. In 2008, the Coginchaug River Watershed Based Plan was developed (http://www.ct.gov/dep/lib/dep/water/watershed_management/wm_plans/coginchaug/cog_planweb.pdf). This document analyzes the entire Coginchaug River watershed, outlines threats to water quality within the watershed, and recommends future actions necessary to maintain or improve water quality.

CT DEEP's Non-Point Source Pollution Program administers a Non-Point Source Grant Program with funding from EPA under Section 319 of the Clean Water Act (319 grant). In 2005, a grant was awarded to the Connecticut River Coastal Conservation District to conduct stream surveys and train volunteers to help DEEP identify NPS pollution problems pertaining to agricultural operations in the Mattabesset regional basin, including the Coginchaug River basin (http://www.depdata.ct.gov/maps/nps/npsmap.htm).

As indicated previously, Middletown and Middlefield are regulated under the MS4 program. The MS4 General Permit is required for any municipality with urbanized areas that initiates, creates, originates or maintains any discharge of stormwater from a storm sewer system to waters of the State. The MS4 permit requires towns to design a Stormwater Management Plan (SMP) to reduce the discharge of pollutants in stormwater to improve water quality. The plan must address the following 6 minimum measures:

1. Public Education and Outreach.
2. Public Involvement/Participation.
3. Illicit discharge detection and elimination.
4. Construction site stormwater runoff control.
5. Post-construction stormwater management in the new development and redevelopment.
6. Pollution prevention/good housekeeping for municipal operations.

Each municipality is also required to submit an annual update outlining the steps they are taking to meet the six minimum measures. All updates that address bacterial contamination in the watershed are summarized in Table 8. No MS4 Annual Report was available for Middlefield at the writing of this document.

Table 8: Summary of MS4 requirement updates related to the reduction of bacterial contamination from Middletown, CT (Permit # GSM000011)

Minimum Measure	City of Middletown Annual Report
Public Outreach and Education	1) Developing educational resources.
Public Involvement and Participation	1) Will conduct community clean-ups. 2) Will update stormwater management plan.
Illicit Discharge Detection and Elimination	1) Mapping all outfalls greater than 12 inches. 2) Developed illicit discharge detection and elimination program.
Construction Site Stormwater Runoff Control	1) Reviewing land use regulations to meet MS4 permit requirements.
Post Construction Stormwater Management	1) Will develop post-construction ordinance or regulation.
Pollution Prevention and Good Housekeeping	1) Swept all streets at least once per year. 2) Will develop program to evaluate and clean stormwater structures at least once a year. 3) Will develop a pollution prevention plan.

RECOMMENDED NEXT STEPS

The watershed community has developed and implemented programs to protect water quality from bacterial contamination. Future mitigative activities are necessary to ensure the long-term protection of the Coginchaug River watershed and have been prioritized below.

1) Continue monitoring of permitted sources.

As Figure 7 displays, there are multiple permitted discharges within the Coginchaug River watershed, particularly near Laurel Brook and Lyman Meadows Brook, and MS4 sampling results were elevated (Table 7). Further monitoring will provide information essential to better locate, understand, and reduce pollution sources. If any current monitoring is not done with appropriate bacterial indicator based on the receiving water, then a recommended change during the next permit reissuance is to include the appropriate indicator species. If facility monitoring indicates elevated bacteria, then implementation of permit required, and voluntary measures to identify and reduce sources of bacterial contamination at the facility are an additional recommendation. Regular monitoring should be established for all permitted sources to ensure compliance with permit requirements and to determine if current requirements are adequate or if additional measures are necessary for water quality protection.

Section 6(k) of the MS4 General Permit requires a municipality to modify their Stormwater Management Plan to implement the TMDL within four months of TMDL approval by EPA if stormwater within the municipality contributes pollutant(s) in excess of the allocation established by the TMDL. For discharges to impaired waterbodies, the municipality must assess and modify the six minimum measures of its plan, if necessary, to meet TMDL standards. Particular focus should be placed on the following plan components: public education, illicit discharge detection and elimination, stormwater structures cleaning, and the repair, upgrade, or retrofit of storm sewer structures. The goal of these modifications is to establish a program that improves water quality consistent with TMDL requirements. Modifications to the Stormwater Management Plan in response to TMDL development should be submitted to the Stormwater Program of DEEP for review and approval.

Table 9 details the appropriate bacteria criteria for use as waste load allocations established by this TMDL for use as water quality targets by permittees as permits are renewed and updated, within the Coginchaug River watershed.

For any municipality subject to an MS4 permit and affected by a TMDL, the permit requires a modification of the SMP to include BMPs that address the included impairment. In the case of bacteria related impairments municipal BMPs could include: implementation or improvement to existing nuisance wildlife programs, septic system monitoring programs, any additional measures that can be added to the required illicit discharge detection and elimination (IDDE) programs, and increased street sweeping above basic permit requirements. Any non-MS4 municipalities can implement these same types of initiatives in effort to reduce bacteria source loading to impaired waterways.

Any facilities that discharge non-MS4 regulated stormwater should update their Pollution Prevention Plan to reflect BMPs that can reduce bacteria loading to the receiving waterway. These BMPs could include nuisance wildlife control programs and any installations that increase surface infiltration to reduce overall stormwater volumes. Facilities that are regulated under the Commercial Activities Stormwater Permit should report any updates to their SMP in their summary documentation submitted to DEEP.

Table 9. Bacteria (e.coli) TMDLs, WLAs, and LAs for Recreational Use

		Instantaneous *E. coli* (#/100mL)						Geometric Mean *E. coli* (#/100mL)	
Class	**Bacteria Source**	**WLA[6]**			**LA[6]**			**WLA[6]**	**LA[6]**
	Recreational Use	1	2	3	1	2	3	**All**	**All**
A	Non-Stormwater NPDES	0	0	0				0	
	CSOs	0	0	0				0	
	SSOs	0	0	0				0	
	Illicit sewer connection	0	0	0				0	
	Leaking sewer lines	0	0	0				0	
	Stormwater (MS4s)	235[7]	410[7]	576[7]				126[7]	
	Stormwater (non-MS4)				235[7]	410[7]	576[7]		126[7]
	Wildlife direct discharge				235[7]	410[7]	576[7]		126[7]
	Human or domestic animal direct discharge[5]				235	410	576		126

(1) **Designated Swimming.** Procedures for monitoring and closure of bathing areas by State and Local Health Authorities are specified in: Guidelines for Monitoring Bathing Waters and Closure Protocol, adopted jointly by the Department of Environmental Protections and the Department of Public Health. May 1989. Revised April 2003 and updated December 2008.

(2) **Non-Designated Swimming.** Includes areas otherwise suitable for swimming but which have not been designated by State or Local authorities as bathing areas, waters which support tubing, water skiing, or other recreational activities where full body contact is likely.

(3) **All Other Recreational Uses.**

(4) Criteria for the protection of recreational uses in Class B waters do not apply when disinfection of sewage treatment plant effluents is not required consistent with Standard 23. (Class B surface waters located north of Interstate Highway I-95 and downstream of a sewage treatment plant providing seasonal disinfection May 1 through October 1, as authorized by the Commissioner.)

(5) Human direct discharge = swimmers

(6) Unless otherwise required by statute or regulation, compliance with this TMDL will be based on ambient concentrations and not end-of-pipe bacteria concentrations

(7) Replace numeric value with “natural levels” if only source is naturally occurring wildlife. Natural is defined as the biological, chemical and physical conditions and communities that occur within the environment which are unaffected or minimally affected by human influences (CT DEEP 2011a). Sections 2.2.2 and 6.2.7 of this Core Document deal with BMPs and delineating type of wildlife inputs.

2) Develop a system to monitor septic systems.

Some residents within Middletown near Laurel Brook and Wadsworth Falls Pond and all residents surrounding Lyman Meadows Brook rely on septic systems. If not already in place, the towns should establish a program to ensure that existing septic systems are properly operated and maintained. For instance, communities can create an inventory of existing septic systems through mandatory inspections. Inspections help encourage proper maintenance and identify failed and sub-standard systems. Policies that govern the eventual replacement of the sub-standard systems within a reasonable timeframe could also be adopted. Towns can also develop programs to assist citizens with the replacement and repair of older and failing systems. Below are specific recommendations made within the Coginchaug River Watershed Based Plan pertaining to septic systems (Coginchaug, 2008):

- Educate watershed residents about the potential water quality problems associated with a failing septic systems.
- Encourage residents to provide regular maintenance of their systems, which will reduce the chance of a system prematurely failing.
- Inspect the sanitary disposal facilities located within Wadsworth Falls Park near Laurel Brook and Wadsworth Falls Pond to ensure there are no illicit discharges reaching these waterbodies.

3) Ensure there are sufficient buffers and BMPs in place on agricultural lands along the impaired segment of Lyman Meadows Brook.

If not already in place, agricultural producers should work with the CT Department of Agriculture and the U.S. Department of Agriculture Natural Resources Conservation Service to develop conservation plans for their farming activities within the watershed. These plans should focus on ensuring that there are sufficient stream buffers, that fencing exists to restrict livestock and horse access to streams and wetlands, and that animal waste handling, disposal, and other appropriate Best Management Practices (BMPs) are in place. Particular attention should be paid to those agricultural operations located within the riparian buffer zone of the impaired segment of Lyman Meadows Brook (Figure 11). Below are specific recommendations made within the Coginchaug River Watershed Based Plan pertaining to agricultural operations (Coginchaug, 2008):

- Comprehensive nutrient management plans (CNMPs) should be developed for agricultural livestock operations of all sizes. These plans will include the creation of specific BMPs that will help to reduce pollutant loads to surface waters within the Coginchaug River watershed.
- Provide educational materials for agricultural operations within the watershed. Education enhances the producer's understanding of the relationship between their practices, farm management plans, and water quality. Include information on how to improve control of stormwater runoff, protect watercourses, and manage pasture waste.

4) Evaluate municipal education and outreach programs regarding animal waste.

Any education and outreach programs should highlight the importance of not feeding waterfowl and wildlife, managing horse and livestock waste, and picking up after dogs and other pets. The town and residents can take measures to minimize waterfowl-related impacts such as allowing tall, coarse vegetation to grow in the riparian areas of the impaired segments that are frequented by waterfowl. Waterfowl, especially grazers like geese, prefer easy access to water. Maintaining an uncut vegetated buffer along the shore will make the habitat less desirable to geese and encourage migration. In addition, any educational program should emphasize that feeding waterfowl, such as ducks, geese, and swans, may contribute to water quality impairments in the Coginchaug River watershed and can harm human health and the environment.

Pet wastes should be disposed of away from any waterbody or storm drain system. BMPs effective at reducing the impact of animal waste on water quality include installing signage, providing pet waste receptacles in high-uses areas, enacting ordinances requiring the clean-up of pet waste, and targeting educational and outreach programs in problem areas. Below are specific recommendations made within the Coginchaug River Watershed Based Plan pertaining to animal waste (Coginchaug, 2008):

- Ensure food is removed from picnic areas within Wadsworth Falls State Park to reduce wildlife, such as waterfowl, from congregating in areas near Wadsworth Falls Pond and the downstream portions of Laurel Brook.
- Install pet waste stations throughout the watershed where residents can deposit their pets waste safely.
- Dogs are attracted to areas with long grass (approximately 4-5 inches high) to defecate. This area of tall grass within Wadsworth Falls State Park should be kept far away from surface waterbodies.

5) Identify areas in the Laurel Brook drainage area to implement Best Management Practices (BMPs) to control stormwater runoff.

As noted above, 32% of the Coginchaug River watershed is considered urban. As such, stormwater runoff is likely contributing bacteria to Laurel Brook. To identify other areas that are contributing bacteria to the impaired segment, Middletown and Middlefield should continue to conduct wet-weather sampling at stormwater outfalls that discharge directly to the impaired segment in the Coginchaug River watershed. Outfalls that have previously shown high bacteria concentrations should be prioritized for BMP installation (Table 7). To treat stormwater runoff, the towns should identify areas along the more developed sections of the impaired segments to install BMPs that encourage stormwater to infiltrate into the ground before entering the waterbodies. These BMPs would disconnect impervious areas and reduce pollutant loads to the river. More detailed information and BMP recommendations can be found in the core TMDL document.

6) Implement a program to evaluate the sanitary sewer system.

Many residents and businesses surrounding Laurel Brook and a portion of Wadsworth Falls Pond rely on a municipal sewer system (Figure 8). Ensuring there are no leaks or overflows from the sanitary sewer in this area should be made a priority. It is important for Middletown to develop programs to evaluate its sanitary sewer and reduce leaks and overflows, especially in the areas around these impaired segments. This program should include periodic inspections of the sewer line.

BACTERIA DATA AND PERCENT REDUCTIONS TO MEET THE TMDL

Table 10: Laurel Brook Bacteria Data

Waterbody ID: CT4607-13_01

Characteristics: Freshwater, Class A, Potential Drinking Water Source, Habitat for Fish and other Aquatic Life and Wildlife, Recreation, and Industrial and Agricultural Water Supply

Impairment: Recreation (*E. coli bacteria)*

Water Quality Criteria for E. coli:

Geometric Mean: 126 colonies/100 mL

Single Sample: 410 colonies/100 mL

Percent Reduction to meet TMDL:

Geometric Mean: **69%**

Single Sample: **93%**

Data: 2001-2001 and 2004-2008 from CT DEEP targeted sampling efforts, 2012 TMDL Cycle

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Laurel Brook with annual geometric means calculated

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1907	Confluence with Coginchaug in Wadsworth Falls State Park	5/9/2001	85	dry	NA
1907	Confluence with Coginchaug in Wadsworth Falls State Park	11/22/2002	160	wet	NA

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Laurel Brook with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1907	Confluence with Coginchaug in Wadsworth Falls SP	5/24/2004	2000	wet	251
1907	Confluence with Coginchaug in Wadsworth Falls SP	5/27/2004	2000	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/1/2004	210	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/7/2004	87	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/14/2004	75	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/21/2004	75	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/28/2004	87	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/6/2004	2000	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/8/2004	1000	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/12/2004	75	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/19/2004	120	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/26/2004	99	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/2/2004	220	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/9/2004	64	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/16/2004	1200	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/23/2004	380	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/30/2004	150	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	5/31/2005	31	dry**	81
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/6/2005	120	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/13/2005	160	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/20/2005	75	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/27/2005	53	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/5/2005	42	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/11/2005	210	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/18/2005	270	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/25/2005	75	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/1/2005	31	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/8/2005	10	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/15/2005	270	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/16/2005	150	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/22/2005	53	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/29/2005	160	dry	

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Laurel Brook with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/19/2006	84	dry	266
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/26/2006	360	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/5/2006	1450†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/10/2006	170	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/17/2006	110	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/24/2006	150	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/31/2006	180	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/7/2006	270	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/14/2006	230	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/21/2006	355†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/28/2006	960	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	5/21/2007	99	dry	**410* (69%)**
1907	Confluence with Coginchaug in Wadsworth Falls SP	5/29/2007	315†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/4/2007	5601†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/11/2007	280†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/18/2007	700†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/25/2007	370†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/2/2007	99†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/9/2007	42†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/11/2007	310	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/16/2007	1250†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/23/2007	350†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/30/2007	167†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/6/2007	366†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/8/2007	2001	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/13/2007	595†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/20/2007	1300†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/27/2007	380†	dry	

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Laurel Brook with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1907	Confluence with Coginchaug in Wadsworth Falls SP	5/19/2008	180	dry	381
1907	Confluence with Coginchaug in Wadsworth Falls SP	5/27/2008	75	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/2/2008	10	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/3/2008	120	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/9/2008	780†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/11/2008	190	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/16/2008	245†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/23/2008	580†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/30/2008	140†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/7/2008	445†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/14/2008	5801†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/21/2008	1200†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/23/2008	1300	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/28/2008	690†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/4/2008	305†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/6/2008	**6100* (93%)**	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/11/2008	400†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/18/2008	235†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/20/2008	575†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/25/2008	203†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	9/3/2008	580	wet	

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Laurel Brook with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1907	Confluence with Coginchaug in Wadsworth Falls SP	5/26/2009	75	dry	171
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/1/2009	110	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/8/2009	70†	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/15/2009	180†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/22/2009	320†	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/29/2009	140	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/7/2009	290	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/13/2009	53	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/20/2009	120	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/27/2009	190	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/3/2009	140	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/10/2009	2001	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/11/2009	150	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/17/2009	290	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/24/2009	320	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/31/2009	81†	dry	

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Laurel Brook with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1907	Confluence with Coginchaug in Wadsworth Falls SP	5/25/2010	53	dry	320
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/1/2010	160	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/7/2010	160	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/14/2010	340	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/21/2010	320	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/28/2010	360	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/7/2010	480	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/12/2010	250	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/19/2010	360	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/21/2010	530	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/26/2010	270	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/2/2010	210	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/9/2010	2001	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/10/2010	260	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/16/2010	2001	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/17/2010	510	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/23/2010	1200	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/25/2010	380	wet	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/27/2010	250	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	8/30/2010	31	dry	
1907	Confluence with Coginchaug in Wadsworth Falls SP	5/23/2011	220	unknown	76
1907	Confluence with Coginchaug in Wadsworth Falls SP	5/31/2011	42	unknown	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/6/2011	53	unknown	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/20/2011	120	unknown	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/27/2011	150	unknown	
1907	Confluence with Coginchaug in Wadsworth Falls SP	6/30/2011	31	unknown	
1907	Confluence with Coginchaug in Wadsworth Falls SP	7/5/2011	53	unknown	

Shaded cells indicate an exceedance of water quality criteria

†Average of two duplicate samples

**** Weather conditions for selected data taken from Hartford because local station had missing data**

***Indicates single sample and geometric mean values used to calculate the percent reduction**

Wet and dry weather geometric mean values for all monitoring stations on Laurel Brook

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
1907	Confluence with Coginchaug in Wadsworth Falls State Park	2001, 2002, 2004-2010	39	80	308	585	162

Shaded cells indicate an exceedance of water quality criteria

Weather condition determined from rain gages at Markham Municipal KMMK station in Meriden, CT and at Hartford Bradley International Airport

Table 11: Wadsworth Falls Pond Bacteria Data

Waterbody ID: CT4607-00-UL_pond_01

Characteristics: Freshwater, Class A, Potential Drinking Water Source, Habitat for Fish and other Aquatic Life and Wildlife, Recreation, and Industrial and Agricultural Water Supply

Impairment: Recreation (*E. coli bacteria)*

Water Quality Criteria for E. coli:

Geometric Mean: 126 colonies/100 mL

Single Sample: 235 colonies/100 mL (designated beach)

Percent Reduction to meet TMDL:

Geometric Mean: **NA**

Single Sample: **88%**

Data: 2003-2011 from CT DEEP targeted sampling efforts, 2012 TMDL Cycle

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Wadsworth Falls Pond with annual geometric means calculated

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1906	Wadsworth Falls	5/19/2003	75	dry	114
1906	Wadsworth Falls	5/27/2003	93†	wet	
1906	Wadsworth Falls	6/2/2003	42†	wet	
1906	Wadsworth Falls	6/9/2003	10	dry	
1906	Wadsworth Falls	6/16/2003	20	wet	
1906	Wadsworth Falls	6/23/2003	42	wet	
1906	Wadsworth Falls	6/30/2003	87	dry	
1906	Wadsworth Falls	7/7/2003	42†	wet	
1906	Wadsworth Falls	7/14/2003	500	dry	
1906	Wadsworth Falls	7/16/2003	560	wet	
1906	Wadsworth Falls	7/17/2003	1300	dry	
1906	Wadsworth Falls	7/21/2003	240	dry	
1906	Wadsworth Falls	7/23/2003	1000	dry	
1906	Wadsworth Falls	7/24/2003	450	dry	
1906	Wadsworth Falls	7/28/2003	120	dry	
1906	Wadsworth Falls	8/4/2003	160†	wet	
1906	Wadsworth Falls	8/6/2003	210	wet	
1906	Wadsworth Falls	8/11/2003	310	wet	
1906	Wadsworth Falls	8/13/2003	20	dry	
1906	Wadsworth Falls	8/18/2003	310	wet	
1906	Wadsworth Falls	8/20/2003	64	dry	
1906	Wadsworth Falls	8/21/2003	110	dry	
1906	Wadsworth Falls	8/25/2003	64	dry	
1906	Wadsworth Falls	8/26/2003	20	dry	

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Wadsworth Falls Pond with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1906	Wadsworth Falls	5/24/2004	150	wet	30
1906	Wadsworth Falls	5/27/2004	240	wet	
1906	Wadsworth Falls	6/1/2004	99	wet	
1906	Wadsworth Falls	6/7/2004	10	dry	
1906	Wadsworth Falls	6/14/2004	15†	wet	
1906	Wadsworth Falls	6/21/2004	10	dry	
1906	Wadsworth Falls	6/28/2004	10	dry	
1906	Wadsworth Falls	7/6/2004	20	wet	
1906	Wadsworth Falls	7/12/2004	10	dry	
1906	Wadsworth Falls	7/19/2004	10	dry	
1906	Wadsworth Falls	7/26/2004	210	dry	
1906	Wadsworth Falls	8/2/2004	20	wet	
1906	Wadsworth Falls	8/9/2004	64	dry	
1906	Wadsworth Falls	8/16/2004	160	wet	
1906	Wadsworth Falls	8/23/2004	10	dry	
1906	Wadsworth Falls	8/30/2004	10	dry	
1906	Wadsworth Falls	5/24/2005	10	wet**	34
1906	Wadsworth Falls	5/31/2005	10†	dry**	
1906	Wadsworth Falls	6/6/2005	10	dry	
1906	Wadsworth Falls	6/13/2005	20	dry	
1906	Wadsworth Falls	6/20/2005	10	dry	
1906	Wadsworth Falls	6/27/2005	42	dry	
1906	Wadsworth Falls	7/5/2005	140	dry	
1906	Wadsworth Falls	7/11/2005	75	dry	
1906	Wadsworth Falls	7/18/2005	31	wet	
1906	Wadsworth Falls	7/25/2005	42	dry	
1906	Wadsworth Falls	8/1/2005	31	dry	
1906	Wadsworth Falls	8/8/2005	20	dry	
1906	Wadsworth Falls	8/15/2005	430	dry	
1906	Wadsworth Falls	8/16/2005	31	dry	
1906	Wadsworth Falls	8/22/2005	20	dry	
1906	Wadsworth Falls	8/29/2005	150	dry	

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Wadsworth Falls Pond with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1906	Wadsworth Falls	5/22/2006	10	dry	31
1906	Wadsworth Falls	5/30/2006	10	dry	
1906	Wadsworth Falls	6/5/2006	20	dry	
1906	Wadsworth Falls	6/12/2006	10	dry	
1906	Wadsworth Falls	6/19/2006	42	dry	
1906	Wadsworth Falls	6/26/2006	64	wet	
1906	Wadsworth Falls	7/5/2006	20	wet	
1906	Wadsworth Falls	7/10/2006	10	dry	
1906	Wadsworth Falls	7/17/2006	120	dry	
1906	Wadsworth Falls	7/24/2006	10†	dry	
1906	Wadsworth Falls	7/31/2006	120	dry	
1906	Wadsworth Falls	8/7/2006	99	dry	
1906	Wadsworth Falls	8/14/2006	10	dry	
1906	Wadsworth Falls	8/21/2006	270	wet	
1906	Wadsworth Falls	8/22/2006	42	dry	
1906	Wadsworth Falls	8/28/2006	53	wet	
1906	Wadsworth Falls	5/21/2007	10	dry	29
1906	Wadsworth Falls	5/29/2007	10	dry	
1906	Wadsworth Falls	6/4/2007	20	wet	
1906	Wadsworth Falls	6/11/2007	10	wet	
1906	Wadsworth Falls	6/18/2007	10†	dry	
1906	Wadsworth Falls	6/25/2007	10	dry	
1906	Wadsworth Falls	7/2/2007	10	dry	
1906	Wadsworth Falls	7/9/2007	560	dry	
1906	Wadsworth Falls	7/11/2007	99	dry	
1906	Wadsworth Falls	7/16/2007	10	wet	
1906	Wadsworth Falls	7/23/2007	10	wet	
1906	Wadsworth Falls	7/30/2007	20	wet	
1906	Wadsworth Falls	8/6/2007	530	dry	
1906	Wadsworth Falls	8/8/2007	75	wet	
1906	Wadsworth Falls	8/13/2007	31	dry	
1906	Wadsworth Falls	8/20/2007	64	dry	
1906	Wadsworth Falls	8/27/2007	31	dry	

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Wadsworth Falls Pond with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1906	Wadsworth Falls	5/19/2008	10	dry	36
1906	Wadsworth Falls	5/27/2008	10	wet	
1906	Wadsworth Falls	6/2/2008	20	dry	
1906	Wadsworth Falls	6/9/2008	830	wet	
1906	Wadsworth Falls	6/11/2008	42	dry	
1906	Wadsworth Falls	6/16/2008	53	wet	
1906	Wadsworth Falls	6/23/2008	10	wet	
1906	Wadsworth Falls	6/30/2008	10	dry	
1906	Wadsworth Falls	7/7/2008	150	dry	
1906	Wadsworth Falls	7/14/2008	64	wet	
1906	Wadsworth Falls	7/21/2008	52	dry	
1906	Wadsworth Falls	7/28/2008	31	wet	
1906	Wadsworth Falls	8/4/2008	480	dry	
1906	Wadsworth Falls	8/11/2008	31	wet	
1906	Wadsworth Falls	8/18/2008	10	dry	
1906	Wadsworth Falls	8/25/2008	10	dry	
1906	Wadsworth Falls	5/19/2009	10	dry	33
1906	Wadsworth Falls	5/26/2009	10	dry	
1906	Wadsworth Falls	6/1/2009	10	dry	
1906	Wadsworth Falls	6/8/2009	10†	dry	
1906	Wadsworth Falls	6/15/2009	64	wet	
1906	Wadsworth Falls	6/22/2009	42	wet	
1906	Wadsworth Falls	6/29/2009	31	dry	
1906	Wadsworth Falls	7/7/2009	10	wet	
1906	Wadsworth Falls	7/13/2009	20	dry	
1906	Wadsworth Falls	7/20/2009	20	dry	
1906	Wadsworth Falls	7/27/2009	42	dry	
1906	Wadsworth Falls	8/3/2009	87	dry	
1906	Wadsworth Falls	8/10/2009	31	dry	
1906	Wadsworth Falls	8/11/2009	150	dry	
1906	Wadsworth Falls	8/17/2009	230	dry	
1906	Wadsworth Falls	8/24/2009	42	dry	
1906	Wadsworth Falls	8/31/2009	110	dry	

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Wadsworth Falls Pond with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1906	Wadsworth Falls	5/25/2010	10	dry	80
1906	Wadsworth Falls	6/1/2010	10	wet	
1906	Wadsworth Falls	6/7/2010	42	dry	
1906	Wadsworth Falls	6/14/2010	140	dry	
1906	Wadsworth Falls	6/21/2010	21†	dry	
1906	Wadsworth Falls	6/28/2010	87	dry	
1906	Wadsworth Falls	7/7/2010	20	dry	
1906	Wadsworth Falls	7/12/2010	120	dry	
1906	Wadsworth Falls	7/19/2010	240	wet	
1906	Wadsworth Falls	7/21/2010	180	wet	
1906	Wadsworth Falls	7/26/2010	87	dry	
1906	Wadsworth Falls	8/2/2010	53	dry	
1906	Wadsworth Falls	8/9/2010	140	dry	
1906	Wadsworth Falls	8/10/2010	120	dry	
1906	Wadsworth Falls	8/16/2010	345†	wet	
1906	Wadsworth Falls	8/17/2010	98	wet	
1906	Wadsworth Falls	8/23/2010	**2001* (88%)**	wet	
1906	Wadsworth Falls	8/25/2010	290	wet	
1906	Wadsworth Falls	8/27/2010	70†	dry	
1906	Wadsworth Falls	8/30/2010	10	dry	
1906	Wadsworth Falls	5/23/2011	10	unknown	21
1906	Wadsworth Falls	5/31/2011	160	unknown	
1906	Wadsworth Falls	6/6/2011	10	unknown	
1906	Wadsworth Falls	6/13/2011	64	unknown	
1906	Wadsworth Falls	6/20/2011	10	unknown	
1906	Wadsworth Falls	6/27/2011	10	unknown	
1906	Wadsworth Falls	6/30/2011	10	unknown	
1906	Wadsworth Falls	7/5/2011	31	unknown	

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Wadsworth Falls Pond with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1905	Wadsworth Falls	5/19/2003	15†	dry	119*
1905	Wadsworth Falls	5/27/2003	10	wet	
1905	Wadsworth Falls	6/2/2003	31	wet	
1905	Wadsworth Falls	6/9/2003	20	dry	
1905	Wadsworth Falls	6/16/2003	10†	wet	
1905	Wadsworth Falls	6/23/2003	20	wet	
1905	Wadsworth Falls	6/30/2003	59†	dry	
1905	Wadsworth Falls	7/7/2003	160	wet	
1905	Wadsworth Falls	7/14/2003	235†	dry	
1905	Wadsworth Falls	7/16/2003	590	wet	
1905	Wadsworth Falls	7/17/2003	1850†	dry	
1905	Wadsworth Falls	7/21/2003	150	dry	
1905	Wadsworth Falls	7/23/2003	780†	dry	
1905	Wadsworth Falls	7/24/2003	330†	dry	
1905	Wadsworth Falls	7/28/2003	185†	dry	
1905	Wadsworth Falls	8/6/2003	220	wet	
1905	Wadsworth Falls	8/11/2003	445†	wet	
1905	Wadsworth Falls	8/13/2003	31	dry	
1905	Wadsworth Falls	8/18/2003	155†	wet	
1905	Wadsworth Falls	8/20/2003	590	dry	
1905	Wadsworth Falls	8/21/2003	310	dry	
1905	Wadsworth Falls	8/25/2003	230†	dry	
1905	Wadsworth Falls	8/26/2003	75	dry	

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Wadsworth Falls Pond with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1905	Wadsworth Falls	5/24/2004	149†	wet	21
1905	Wadsworth Falls	5/27/2004	210	wet	
1905	Wadsworth Falls	6/1/2004	20	wet	
1905	Wadsworth Falls	6/7/2004	10	dry	
1905	Wadsworth Falls	6/14/2004	42	wet	
1905	Wadsworth Falls	6/21/2004	10	dry	
1905	Wadsworth Falls	6/28/2004	10	dry	
1905	Wadsworth Falls	7/6/2004	10	wet	
1905	Wadsworth Falls	7/12/2004	10	dry	
1905	Wadsworth Falls	7/19/2004	10	dry	
1905	Wadsworth Falls	7/26/2004	10	dry	
1905	Wadsworth Falls	8/2/2004	10	wet	
1905	Wadsworth Falls	8/9/2004	31	dry	
1905	Wadsworth Falls	8/16/2004	190	wet	
1905	Wadsworth Falls	8/23/2004	10	dry	
1905	Wadsworth Falls	8/30/2004	10	dry	
1905	Wadsworth Falls	5/24/2005	15†	wet**	35
1905	Wadsworth Falls	5/31/2005	10	dry**	
1905	Wadsworth Falls	6/6/2005	10	dry	
1905	Wadsworth Falls	6/13/2005	75	dry	
1905	Wadsworth Falls	6/20/2005	31	dry	
1905	Wadsworth Falls	6/27/2005	31	dry	
1905	Wadsworth Falls	7/5/2005	210	dry	
1905	Wadsworth Falls	7/11/2005	150	dry	
1905	Wadsworth Falls	7/18/2005	42	wet	
1905	Wadsworth Falls	7/25/2005	42	dry	
1905	Wadsworth Falls	8/1/2005	31	dry	
1905	Wadsworth Falls	8/8/2005	10	dry	
1905	Wadsworth Falls	8/15/2005	290†	dry	
1905	Wadsworth Falls	8/16/2005	20†	dry	
1905	Wadsworth Falls	8/22/2005	20	dry	
1905	Wadsworth Falls	8/29/2005	20	dry	

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Wadsworth Falls Pond with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1905	Wadsworth Falls	5/22/2006	10†	dry	24
1905	Wadsworth Falls	5/30/2006	10†	dry	
1905	Wadsworth Falls	6/5/2006	10	dry	
1905	Wadsworth Falls	6/12/2006	10	dry	
1905	Wadsworth Falls	6/19/2006	42	dry	
1905	Wadsworth Falls	6/26/2006	64	wet	
1905	Wadsworth Falls	7/5/2006	10	wet	
1905	Wadsworth Falls	7/10/2006	10	dry	
1905	Wadsworth Falls	7/17/2006	10	dry	
1905	Wadsworth Falls	7/24/2006	160	dry	
1905	Wadsworth Falls	7/31/2006	20	dry	
1905	Wadsworth Falls	8/7/2006	42	dry	
1905	Wadsworth Falls	8/14/2006	10	dry	
1905	Wadsworth Falls	8/21/2006	310	wet	
1905	Wadsworth Falls	8/22/2006	31	dry	
1905	Wadsworth Falls	8/28/2006	42	wet	
1905	Wadsworth Falls	5/21/2007	10	dry	30
1905	Wadsworth Falls	5/29/2007	10	dry	
1905	Wadsworth Falls	6/4/2007	10	wet	
1905	Wadsworth Falls	6/11/2007	10	wet	
1905	Wadsworth Falls	6/18/2007	10	dry	
1905	Wadsworth Falls	6/25/2007	10	dry	
1905	Wadsworth Falls	7/2/2007	75	dry	
1905	Wadsworth Falls	7/9/2007	700	dry	
1905	Wadsworth Falls	7/11/2007	87	dry	
1905	Wadsworth Falls	7/16/2007	10†	wet	
1905	Wadsworth Falls	7/23/2007	20	wet	
1905	Wadsworth Falls	7/30/2007	31	wet	
1905	Wadsworth Falls	8/6/2007	10	dry	
1905	Wadsworth Falls	8/8/2007	210	wet	
1905	Wadsworth Falls	8/13/2007	48†	dry	
1905	Wadsworth Falls	8/20/2007	210	dry	
1905	Wadsworth Falls	8/27/2007	20	dry	

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Wadsworth Falls Pond with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1905	Wadsworth Falls	5/19/2008	10	dry	25
1905	Wadsworth Falls	5/27/2008	10	wet	
1905	Wadsworth Falls	6/2/2008	10	dry	
1905	Wadsworth Falls	6/9/2008	590	wet	
1905	Wadsworth Falls	6/11/2008	10	dry	
1905	Wadsworth Falls	6/16/2008	10	wet	
1905	Wadsworth Falls	6/23/2008	20	wet	
1905	Wadsworth Falls	6/30/2008	42	dry	
1905	Wadsworth Falls	7/7/2008	42	dry	
1905	Wadsworth Falls	7/14/2008	140	wet	
1905	Wadsworth Falls	7/21/2008	110	dry	
1905	Wadsworth Falls	7/28/2008	53	wet	
1905	Wadsworth Falls	8/4/2008	10	dry	
1905	Wadsworth Falls	8/11/2008	10	wet	
1905	Wadsworth Falls	8/18/2008	10	dry	
1905	Wadsworth Falls	8/25/2008	10	dry	
1905	Wadsworth Falls	5/19/2009	10	dry	28
1905	Wadsworth Falls	5/26/2009	10	dry	
1905	Wadsworth Falls	6/1/2009	10	dry	
1905	Wadsworth Falls	6/8/2009	10	dry	
1905	Wadsworth Falls	6/15/2009	10	wet	
1905	Wadsworth Falls	6/22/2009	31	wet	
1905	Wadsworth Falls	6/29/2009	10	dry	
1905	Wadsworth Falls	7/7/2009	10	wet	
1905	Wadsworth Falls	7/13/2009	10	dry	
1905	Wadsworth Falls	7/20/2009	20	dry	
1905	Wadsworth Falls	7/27/2009	31	dry	
1905	Wadsworth Falls	8/3/2009	53	dry	
1905	Wadsworth Falls	8/10/2009	510	dry	
1905	Wadsworth Falls	8/11/2009	110	dry	
1905	Wadsworth Falls	8/17/2009	97	dry	
1905	Wadsworth Falls	8/24/2009	31	dry	
1905	Wadsworth Falls	8/31/2009	220	dry	

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Wadsworth Falls Pond with annual geometric means calculated (continued)

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
1905	Wadsworth Falls	5/25/2010	10†	dry	77
1905	Wadsworth Falls	6/1/2010	10	wet	
1905	Wadsworth Falls	6/7/2010	31	dry	
1905	Wadsworth Falls	6/14/2010	42	dry	
1905	Wadsworth Falls	6/21/2010	10	dry	
1905	Wadsworth Falls	6/28/2010	87	dry	
1905	Wadsworth Falls	7/7/2010	42	dry	
1905	Wadsworth Falls	7/12/2010	53	dry	
1905	Wadsworth Falls	7/19/2010	110†	wet	
1905	Wadsworth Falls	7/21/2010	150	wet	
1905	Wadsworth Falls	7/26/2010	110	dry	
1905	Wadsworth Falls	8/2/2010	64	dry	
1905	Wadsworth Falls	8/9/2010	250	dry	
1905	Wadsworth Falls	8/10/2010	107†	dry	
1905	Wadsworth Falls	8/16/2010	**2001* (88%)**	wet	
1905	Wadsworth Falls	8/17/2010	190†	wet	
1905	Wadsworth Falls	8/23/2010	**2001* (88%)**	wet	
1905	Wadsworth Falls	8/25/2010	190	wet	
1905	Wadsworth Falls	8/27/2010	42	dry	
1905	Wadsworth Falls	8/30/2010	10	dry	
1905	Wadsworth Falls	5/23/2011	10	unknown	16
1905	Wadsworth Falls	5/31/2011	10	unknown	
1905	Wadsworth Falls	6/6/2011	10	unknown	
1905	Wadsworth Falls	6/13/2011	64	unknown	
1905	Wadsworth Falls	6/20/2011	10†	unknown	
1905	Wadsworth Falls	6/27/2011	31	unknown	
1905	Wadsworth Falls	6/30/2011	10	unknown	
1905	Wadsworth Falls	7/5/2011	20	unknown	

Shaded cells indicate an exceedance of water quality criteria
†Average of two duplicate samples
**** Weather conditions for selected data taken from Hartford because local station had missing data**
***Indicates single sample and geometric mean values used to calculate the percent reduction**

Wet and dry weather geometric mean values for all monitoring stations on Wadsworth Falls Pond

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
1906	Wadsworth Falls	2003-2011	46	96	45	60	39
1905	Wadsworth Falls	2003-2011	46	96	40	54	35

Shaded cells indicate an exceedance of water quality criteria

Weather condition determined from rain gages at Markham Municipal KMMK station in Meriden, CT and at Hartford Bradley International Airport

Table 12: Lyman Meadows Brook Bacteria Data

Waterbody ID: CT4607-08_01

Characteristics: Freshwater, Class A, Potential Drinking Water Source, Habitat for Fish and other Aquatic Life and Wildlife, Recreation, and Industrial and Agricultural Water Supply

Impairment: Recreation (*E. coli bacteria)*

Water Quality Criteria for E. coli:

Geometric Mean: 126 colonies/100 mL

Single Sample: 410 colonies/100 mL

Percent Reduction to meet TMDL:

Geometric Mean: **97%**

Single Sample: **98%**

Data: 1998 and 2008 from CT DEEP targeted sampling efforts, 2012 TMDL Cycle

Single sample *E. coli* (colonies/100 mL) data from all monitoring stations on Lyman Meadows Brook with annual geometric means calculated

Station Name	Station Location	Date	Results	Wet/Dry	Geomean
420	Upstream of Route 147 crossing	7/23/1998	540	unknown	540
420	Upstream of Route 147 crossing	9/23/1998	540	unknown	
420	Upstream of Route 147 crossing	7/23/2008	5500†	wet	**3649* (97%)**
420	Upstream of Route 147 crossing	8/6/2008	**24001* (98%)**	wet	
420	Upstream of Route 147 crossing	8/20/2008	1700	dry	
420	Upstream of Route 147 crossing	9/3/2008	790	wet	

Shaded cells indicate an exceedance of water quality criteria
†Average of two duplicate samples
***Indicates single sample and geometric mean values used to calculate the percent reduction**

Wet and dry weather geometric mean values for all monitoring stations on Lyman Meadows Brook

Station Name	Station Location	Years Sampled	Number of Samples		Geometric Mean		
			Wet	Dry	All	Wet	Dry
420	Upstream of Route 147 crossing	1998, 2008	3	1	3649	4704	NA

Shaded cells indicate an exceedance of water quality criteria
Weather condition determined from rain gage at Markham Municipal KMMK station in Meriden, CT

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